

May 6, 1947.

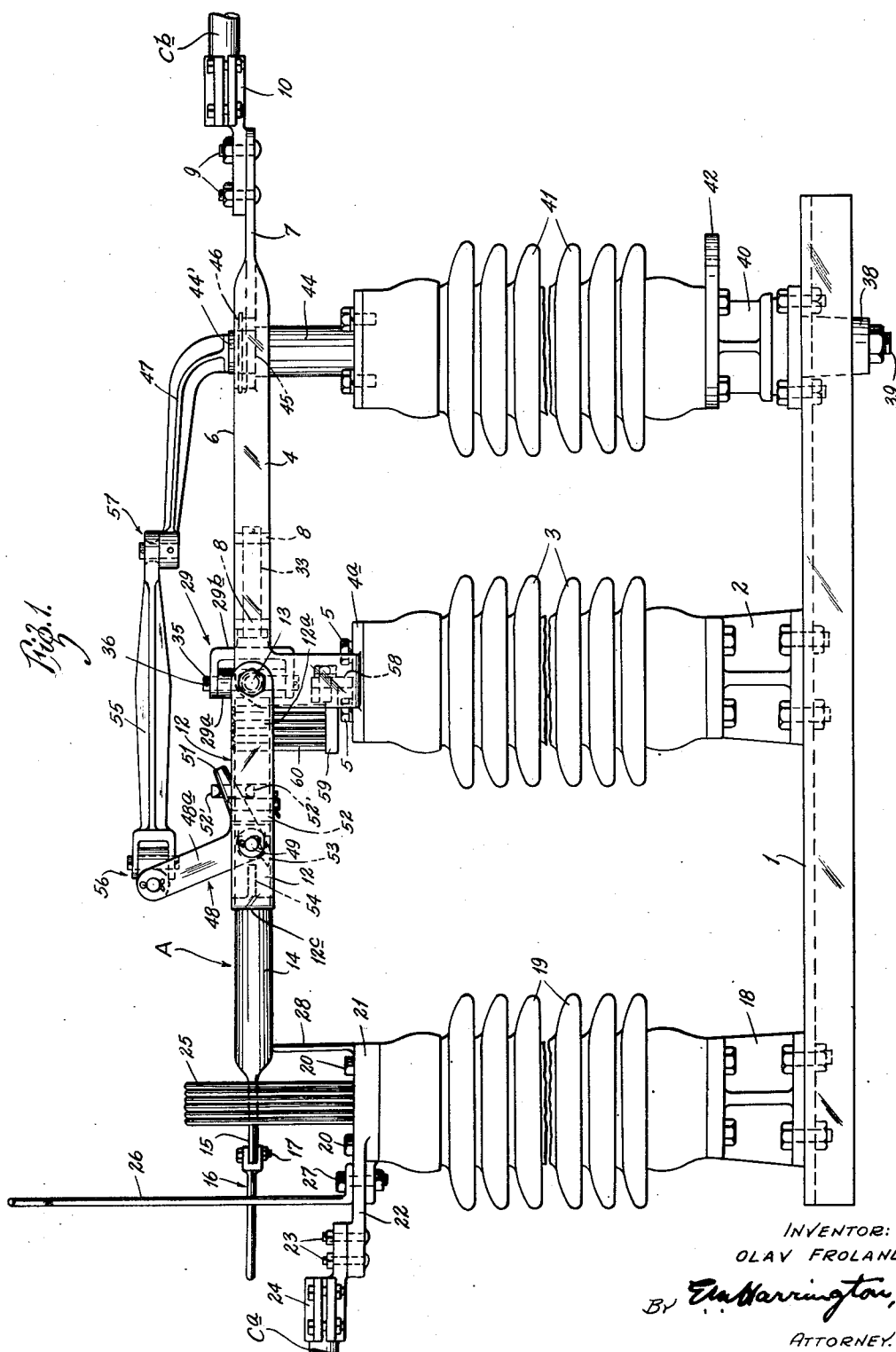
O. FROLAND

2,420,074

ELECTRICAL SWITCH

Filed Nov. 18, 1943

3 Sheets-Sheet 1



May 6, 1947.

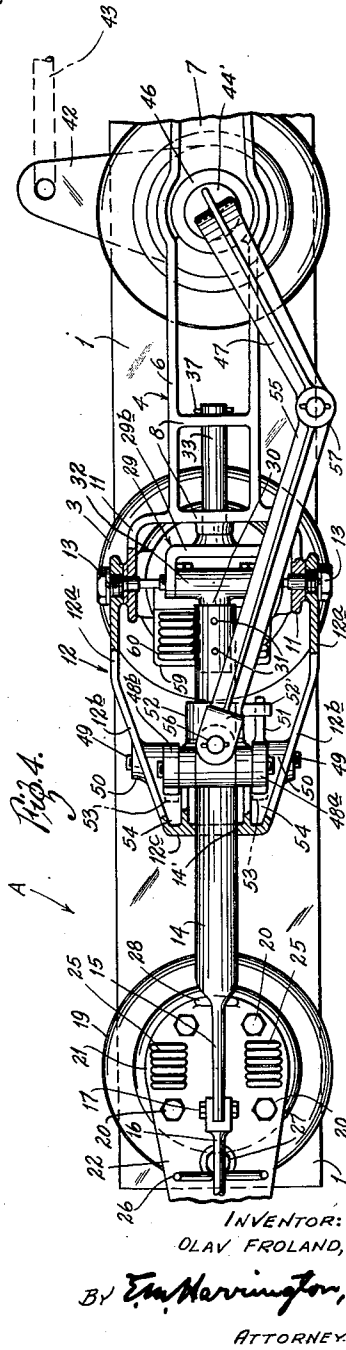
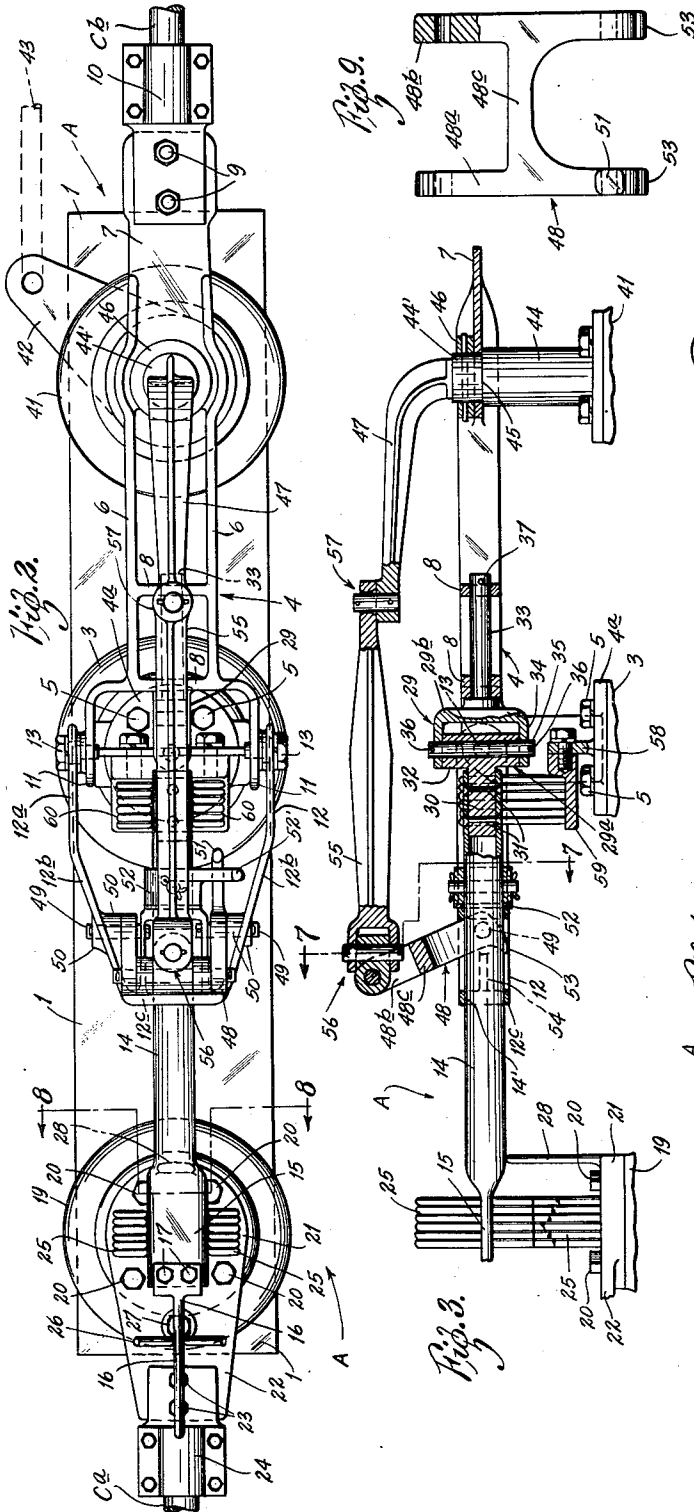
O. FROLAND

2,420,074

ELECTRICAL SWITCH

Filed Nov. 18, 1943

3 Sheets-Sheet 2



May 6, 1947.

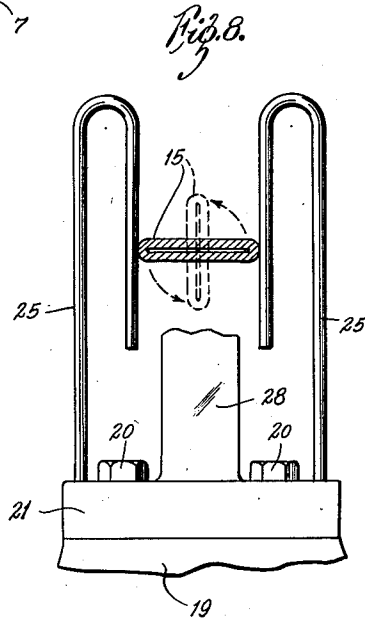
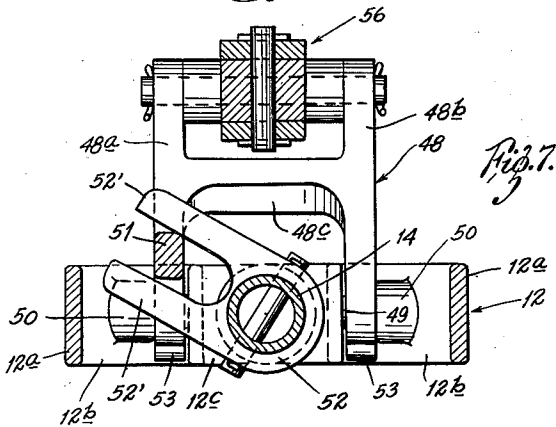
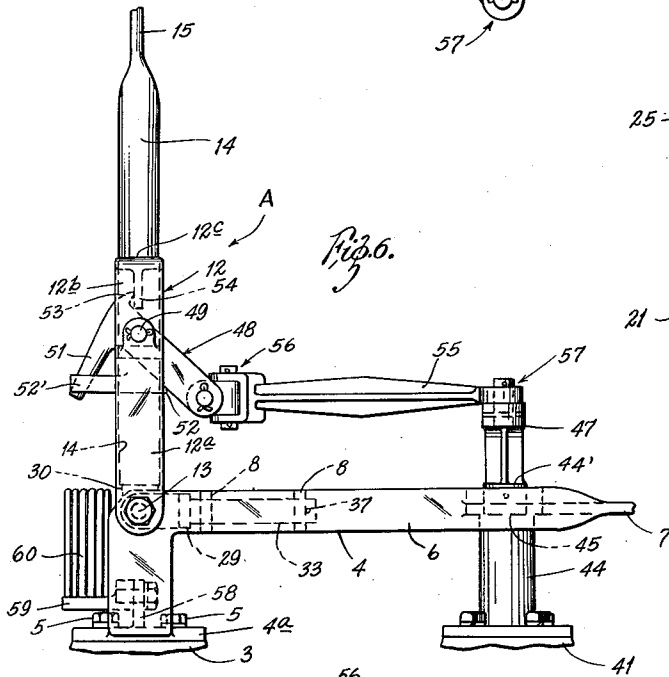
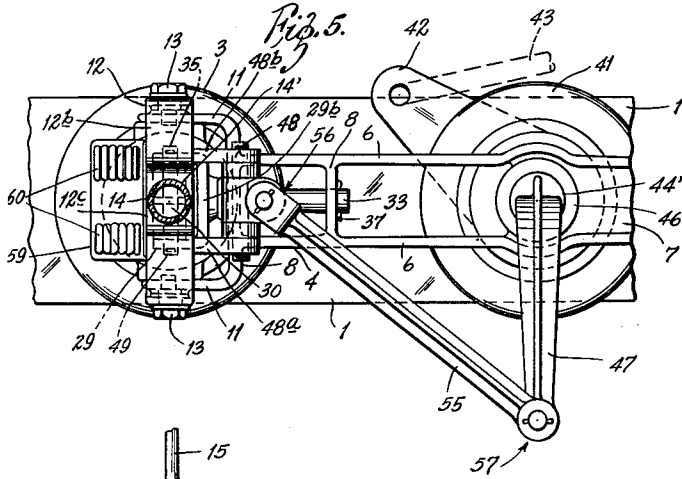
O. FROLAND

2,420,074

ELECTRICAL SWITCH

Filed Nov. 18, 1943

3 Sheets-Sheet 3



INVENTOR:
OLAV FROLAND,
BY *Emm Harrington*,
ATTORNEY.

UNITED STATES PATENT OFFICE

2,420,074

ELECTRICAL SWITCH

Olav Froland, St. Louis, Mo., assignor to James R. Kearney Corporation, St. Louis, Mo., a corporation of Missouri

Application November 18, 1943, Serial No. 510,715

4 Claims. (Cl. 200-48)

1

This invention relates generally to electrical switches, and more specifically to heavy duty electrical switches of the rotating insulator type, the predominant object of the invention being to provide an electrical switch of this type which, because of its improved construction and arrangement, is greatly simplified in its construction and operation, and is rendered capable of performing its intended function in an improved and highly efficient manner.

Fig. 1 is a side elevation of the improved switch of the present invention.

Fig. 2 is a plan view of the switch illustrated in Fig. 1.

Fig. 3 is a fragmentary longitudinal section illustrating a portion of the switch shown in Figs. 1 and 2.

Fig. 4 is a fragmentary plan view of the improved switch but showing parts thereof in positions different from those occupied by said parts in Fig. 2.

Fig. 5 is a fragmentary plan view of the improved switch with parts thereof shown in still different positions.

Fig. 6 is a fragmentary side elevation of the portion of the switch illustrated in Fig. 5.

Fig. 7 is an enlarged cross-section taken on line 7-7 of Fig. 3.

Fig. 8 is an enlarged cross-section taken on line 8-8 of Fig. 2.

Fig. 9 illustrates in elevation and partly in section a part of the improved switch.

In the drawings, wherein is shown for the purposes of illustration, merely, one embodiment of the invention, A designates the improved switch generally. The switch A includes a base structure 1 which is adapted to be supported by suitable means (not shown) so as to locate the switch in a desired position for use.

Secured to the base structure 1 and extended upwardly therefrom is a supporting member 2 which supports a stationary insulator 3. The insulator 3 has fixed thereto at its top a member 4, which at its forward end is provided with a horizontal wall 4a through which suitable fastening devices 5 are extended for the purpose of securing the member 4 to the insulator 3. The member 4 is provided with spaced side walls 6 which extend upwardly from the horizontal wall 4a and horizontally in a rearward direction therefrom, said member 4, at its rear end, being provided with a solid wall 7 which extends from side wall to side wall of said member 4 and projects rearwardly of said side walls, as is shown to good advantage in Fig. 3. Extending trans-

2

versely of the member 4 from one side wall 6 to the other thereof is a pair of transverse walls 8 that aid in imparting the required structural strength to said member 4 and perform an additional function which will be hereinafter referred to. Secured to the rear end portion of the wall 7 of the member 4, by suitable fastening devices 9, is a terminal member 10 which mechanically and electrically engages an electrical conductor 10 Cb that is associated with the switch A.

At its forward end the member 4 is bifurcated; that is to say, forward extensions 11 of the side walls 6 of said member are provided which are spaced apart to a greater degree than are the side walls 6 of the member 4 (see Figs. 2, 4, and 5). Pivoted to the spaced, forward extensions 11 of the member 4 is an arm structure 12 which comprises rear, spaced portions 12a that are disposed outwardly of the extensions 11 of the member 4 in substantial parallelism therewith, convergent portions 12b that extend forwardly from the portions 12a, and a transversely extended forward portion 12c which joins the forward ends of said convergent portions 12b. Pivotal connection between the arm structure 12 and the extensions 11 of the member 4 is effected by pivot bolts 13 which are provided with screw-threaded portions that are screwed into openings formed in the portions 12a of the arm structure, and include smooth inner portions which extend into bearing openings formed in said extensions 11 of the member 4 (Fig. 4).

Supported in part by the arm structure 12 is a switch blade 14 which is arranged for axial rotation in an opening 14' formed through the forward portion 12c of said arm structure (Fig. 4). The switch blade 14 preferably is in the form of a metallic tube, and the forward portion of this tube is flattened, as indicated at 15 and as shown to good advantage in Fig. 8, so as to provide said switch blade with a forward portion of increased width which performs a function to be hereinafter set forth. Fixed to the flattened portion 15 of the switch blade 14 is an arcing element 16, said arcing element including a bifurcated rear end portion which embraces an edge portion of the switch blade portion 15 and is secured thereto by fastening devices 17, and a rod portion extended forwardly from said bifurcated portion.

Secured to the base structure 1 of the improved switch A is a supporting member 18 (Fig. 1) which has fixed thereto for support an insulator 19. Secured to the top of the insulator 19 by fastening devices 20 is a member 21 which is

3

formed of electrical conducting material. The member 21 includes a forwardly extended plate portion 22, to the forward end portion of which is secured by fastening devices 23 a terminal member 24, said terminal member mechanically and electrically engaging an electrical conductor Ca which is associated with the switch A. Also, the member 21 supports an opposed pair of contacts 25 with which the switch blade portion 15 is adapted to make electrical contact, as will presently appear herein in greater detail, each contact being made up of a plurality of lengths of resilient wire or rod material, shaped as shown to the best advantage in Fig. 8. Additionally, an arcing horn structure 26 with which the arcing element 16 at the forward end of the switch blade 14 cooperates during operation of the switch is supported by the member 21, said arcing horn comprising a pair of spaced, upstanding portions which are flared at their upper ends and are joined by a loop portion at their lower ends, the arcing horn structure being secured to the plate 22 of the member 21 by a suitable fastening device 27 that engages the loop portion thereof, as shown in Fig. 1.

As will presently appear herein in greater detail, the switch blade 14 is movable at its outer end upwardly and downwardly in an arc of a circle about the pivot points provided by the pivot bolts 13, and during such movement of said switch blade the forwardly extended rod of the arcing element 16 moves through the space between the upwardly extended, spaced portions of the arcing horn 26. Also, in order to arrest downward movement of the forward portion of the switch blade so that it will be supported in its proper lowered position, as shown in Fig. 1, the member 21 is provided with an upwardly projected extension 28 which provides an abutment with which the switch blade contacts when it reaches its lowered position.

Located at the rear end of the switch blade 14 is a pivotal joint 29 (Fig. 3) which comprises a joint member 29a associated with the switch blade 14 and a joint member 29b associated with the member 4. The joint member 29a includes a shank 30 which is disposed within the rear end portion of the tubular switch blade 14, and suitable fastening devices 31 rigidly secure said shank to said switch blade. At the outer end of said shank 30 of said joint member 29a an elongated head 32 is provided which has an opening formed longitudinally therethrough. The joint member 29b includes a shank 33 which is supported for axial rotation in aligned openings formed through the transverse walls 8 of the member 4, said shank 33 at its forward end being provided with a bifurcated head 34 between the spaced legs of which the elongated head 32 of the joint member 29a is disposed. The spaced legs of the bifurcated portion 34 of the joint portion 29b are provided with openings which are aligned with the opening of the elongated head 32 of the joint portion 29a, and disposed in said aligned openings of the legs of the bifurcated portion of the joint member 29b and the elongated head of the joint member 29a is a pivot pin 35. The pivot pin 35 is retained in its proper position by suitably located pins 36, and likewise, the shank 33 of the joint member 29b is retained in position with respect to the transverse walls 8 of the member 4 by a pin 37.

Supported by the base structure 1 of the improved switch A is a bearing member 38 (Fig. 1) and supported by said bearing member for axial

4

rotation is a rotary spindle 39, said rotary spindle being rigidly associated with a connecting member 40 which is rotatable with said spindle, and said connecting member having secured thereto for rotation therewith an insulator 41. The connecting member 40, at its upper end, is provided with a rigid arm 42 which is adapted to have connected to its outer end an operating element (shown in dotted lines at 43 in Figs. 2, 4, and 5) which is operable to swing the outer end portion of said arm 42 in an arc of a circle so as to subject said spindle 39, said connecting member 40, and said insulator 41 to axial rotation. Rigidly fixed to the insulator 41 at the top thereof is an upstanding shank 44 which is provided with an upper portion 44' of reduced diameter (Fig. 3), there being an annular shoulder 45 which contacts with the lower face of the wall 7 of the member 4 and the upper portion 44' of said shank 44 being extended through an opening formed through said wall 7. Also, the reduced upper portion 44' of the shank 44 has mounted thereon and fixedly secured thereto a collar 46 whose lower face contacts with the top face of the wall 7 of the member 4. The top face of the reduced upper portion 44' of the shank 44 has fixed thereto an arm 47.

Supported for pivotal movement by the arm structure 12 of the switch A is a lever structure 48 which is pivoted to said arm structure by pivot elements 49 (Fig. 2), there being bosses 50 formed on the convergent portions 12b of said arm structure which facilitate the pivotal connection of the lever structure to the arm structure. The construction of the lever structure is shown to good advantage in Fig. 7, wherein it is shown as being provided with spaced arms 48a and 48b which are joined intermediate their ends by an integral, transverse portion 48c. Also the arm 48a of the lever structure 48 is provided at its lower end with an integral, rearwardly projected extension 51 which gives to said arm 48a the form of a bell crank lever (see Fig. 1). The switch blade 14 has fixedly secured thereto a forked member 52, between the spaced legs 52' of which the extension 51 of the lever structure 48 is extended. The lever structure 48 is provided at the lower ends of the spaced arms 48a and 48b thereof with forwardly projected abutment elements 53 which are adapted during operation of the switch to move into contact with webs 54 that are integral portions of the arm structure 12 of the switch for a purpose to be hereinafter explained.

The upper portion of the lever structure 48 and the forward end of the arm 47 are connected by an arm 55, there being a universal joint 56 at the point of connection of the arm 55 to the upper portion of the lever structure 48, and the opposite end of the arm 55 being loosely pivoted to the arm 47, as shown at 57 in Fig. 3, to permit of slight upward movement of the forward end of the arm 55 as it moves in an arc of a circle with the upper portion of the lever structure 48. The horizontal wall 4a of the member 4 is provided with a vertically projected extension 58 (Fig. 3) to which a member 59 is secured by suitable fastening devices, said member 59 having secured thereto and extended upwardly therefrom a pair of opposed contact structures 60 which are shaped and arranged in accordance with the contact structures 25 previously referred to herein and illustrated in Fig. 8. The contact structures 60 frictionally engage a rear portion of the switch blade 14 when

5

said switch blade is in its lowered position, as shown in Fig. 1, so that a positive by-path for electrical energy passing through the switch will be provided around the pivotal joint 29 and from the switch blade 14 to the member 4.

In describing the operation of the improved switch A it will be assumed that the switch is in the circuit-closing position, at which time the flattened, forward portion 15 of the switch blade 14 is positioned as shown by full lines in Fig. 8 where its opposite side edges contact closely with the opposed contact structures 25. When the switch is so positioned the path for electrical energy moving through the switch is made up of the conductor Ca, the terminal 24, the member 21 and its plate 22, the contact structures 25, the switch blade 14, the contact structures 60, the member 4, the terminal 10, and the conductor Cb. It is important to note that when the switch is in the circuit-closing position the switch blade 14 is positively locked against unintended movement out of contact with the contact structures 25, because of the fact that the pivot pin 35 of the pivotal joint 29 is disposed at an angle relative to the pivot bolts 13 which pivotally connect the switch blade to the member 4 through the instrumentality of the arm structure 12. In other words; because of the non-alinement of the pivot pin 35 of the pivotal joint 29 with respect to the pivot bolts 13 which provide for pivotal movement of the switch blade, pivotal movement of the switch blade will be prevented and the flattened portion 15 of said switch blade will be retained in proper contacting relation with respect to the contact structures 25.

Assume, now, that it is desired to move the switch blade 14 from the circuit-closing position, in which it is shown in Fig. 1, to the circuit-interrupting position, in which said switch blade is shown in Fig. 6. To accomplish this purpose, force is applied to the operating element 43 so as to rotate the insulator 41 and thereby swing the forward end portion of the arm 47 horizontally in an arc of a circle outwardly and rearwardly, as is indicated in Fig. 4. Such movement of the arm 47 is transmitted by the arm 55 to the lever structure 48 with the result that the upper portion of said lever structure swings rearwardly as the lever structure moves about its pivots 49. As the lever structure 48 moves about its pivots in response to movement of the arm 47 the extension 51 of said lever structure moves downwardly and rotates the forked member 52 with the result that the switch blade 14, to which said forked member is rigidly fixed, will be rotated about its axis in the opening 14' of the forward portion 12c of the arm structure 12 and in contact with the abutment member 28. During such axial rotation of the switch blade the flattened portion 15 of the switch blade is shifted from the position shown in Fig. 8 where its edges frictionally engage the contact structures 25, to a position where said flattened switch blade portion is out of contact with said contact structures 25. Simultaneously, such axial rotation of the switch blade causes the pivot pin 35 of the pivotal joint 29 to be alined horizontally with the pivot bolts 13 which pivotally connect the arm structure 12 to the member 4 (see Fig. 4).

As the operation of subjecting the switch blade to axial rotation reaches its end the abutment elements 53 of the lever structure 48 move into engagement with the lower faces of the webs 54 of the arm structure 12 thereby arresting further rotary movement of the lever structure, and con-

6

tinued rotation of the arm 47 will raise the forward end portion of the switch blade 14 to the position in which said switch blade is shown in Fig. 6. During upward and rearward movement thereof the switch blade 14 and the arm structure 12 pivot about the alined pivot pin 35 of the pivotal joint 29 and the pivot bolts 13 which pivotally attach the arm structure to the member 4, and because said pivots are in complete alinement there is no interference with free pivotal movement of said parts.

To move the switch blade 14 from the circuit-interrupting position shown in Fig. 6 to the circuit-closing position shown in Fig. 1, the operation just described is reversed. That is to say; the insulator 41 is rotated to swing the arm 47 in the proper direction to lower the switch blade to a horizontal position where its forward end portion rests on the abutment 28, the abutment elements 53 of the lever structure 48, during such movement of the switch blade, being in engagement with the webs 54 of the arm structure 12. When the switch blade has reached its horizontal position, continued movement of the arm 47 rotates the lever structure 48 about its pivots 49 with the result that the switch blade is rotated axially through cooperative action of the extension 51 of said lever structure and the forked member 52 fixed to the switch blade. Such rotation of the switch blade causes the opposed edges of the flattened portion 15 of the switch blade to frictionally engage the contact structures 25 and moves the pivot pin 35 of the pivotal joint 29 out of alinement relative to the pivot bolts 13 that pivotally attach the arm structure 12 to the member 4 so as to positively lock the switch blade in its lowered position.

I claim:

1. An electrical switch comprising contact means, a switch blade including a part supported for rotary movement about its axis so as to move a portion of said switch blade part into and out of contact engagement with respect to said contact means and a switch blade part for supporting said axially rotatable switch blade part for axial rotation with respect thereto, a stationary member, pivot means for pivotally attaching said supporting switch blade part to said stationary member whereby the entire switch blade may be moved pivotally to and from the circuit closing position with relation to said contact means, and means operable during a single continuous operation thereof to first subject said axially rotatable part of said switch blade to axial rotation and thereafter subject said switch blade to pivotal movement, the last-mentioned means including a pivotally supported lever structure mounted on said supporting part of said switch blade, a member fixed to said axially rotatable part of said switch blade and engaged by a portion of said lever structure so as to rotate said member and said axially rotatable switch blade part during pivotal movement of said lever structure, abutment means forming part of said lever structure for engaging a part of said switch blade so as to cause said switch blade to be moved pivotally, and means for subjecting said lever structure to pivotal movement and for subjecting said switch blade to pivotal movement.

2. An electrical switch comprising contact means, a switch blade including a part supported for rotary movement about its axis so as to move a portion of said switch blade part into and out of contact engagement with respect to said contact means and a switch blade part for support-

ing said axially rotatable switch blade part for axial rotation with respect thereto, a stationary member, pivot means for pivotally attaching said supporting switch blade part to said stationary member whereby the entire switch blade may be moved pivotally to and from the circuit closing position with relation to said contact means, and means operable during a single continuous operation thereof to first subject said axially rotatable part of said switch blade to axial rotation and thereafter subject said switch blade to pivotal movement, the last-mentioned means including a pivotally supported lever structure mounted on said supporting part of said switch blade, a member fixed to said axially rotatable part of said switch blade and engaged by a portion of said lever structure so as to rotate said member and said axially rotatable switch blade part during pivotal movement of said lever structure, abutment means forming part of said lever structure for engaging said supporting part of said switch blade so as to cause said switch blade to be moved pivotally, and means for subjecting said lever structure to pivotal movement and for subjecting said switch blade to pivotal movement.

3. An electrical switch comprising contact means, a switch blade including a part supported for rotary movement about its axis so as to move a portion of said switch blade part into and out of contact engagement with respect to said contact means and a switch blade part for supporting said axially rotatable switch blade part for axial rotation with respect thereto, a stationary member, pivot means for pivotally attaching said supporting switch blade part to said stationary member whereby the entire switch blade may be moved pivotally to and from the circuit closing position with relation to said contact means, means operable during a single continuous operation thereof to first subject said axially rotatable part of said switch blade to axial rotation and thereafter subject said switch blade to pivotal movement, the last-mentioned means including a pivotally supported lever structure mounted on said supporting part of said switch blade, a member fixed to said axially rotatable part of said switch blade and engaged by a portion of said lever structure so as to rotate said member and said axially rotatable switch blade part during pivotal movement of said lever structure, abutment means forming part of said lever structure for engaging a part of said switch blade so as to cause said switch blade to be moved pivotally, and means for subjecting said lever structure to pivotal movement and for subjecting said switch blade to pivotal movement, and a joint structure associated with said axially rotatable switch blade part, said joint structure having a pivot which in one position of said axially rotatable switch blade part is offset relative to said pivot means which pivotally connects said supporting switch blade part to said stationary member so as to prevent pivotal move-

ment of the switch blade and which in another position of said axially rotatable switch blade part is aligned with said pivot means so as to permit pivotal movement of said switch blade.

4. An electrical switch comprising contact means, a switch blade including a part supported for rotary movement about its axis so as to move a portion of said switch blade part into and out of contact engagement with respect to said contact means and a switch blade part for supporting said axially rotatable switch blade part for axial rotation with respect thereto, a stationary member, pivot means for pivotally attaching said supporting switch blade part to said stationary member whereby the entire switch blade may be moved pivotally to and from the circuit closing position with relation to said contact means, means operable during a single continuous operation thereof to first subject said axially rotatable part of said switch blade to axial rotation and thereafter subject said switch blade to pivotal movement, the last-mentioned means including a pivotally supported lever structure mounted on said supporting part of said switch blade, a member fixed to said axially rotatable part of said switch blade and engaged by a portion of said lever structure so as to rotate said member and said axially rotatable switch blade part during pivotal movement of said lever structure, abutment means forming part of said lever structure for engaging a part of said switch blade so as to cause said switch blade to be moved pivotally, and means for subjecting said lever structure to pivotal movement and for subjecting said switch blade to pivotal movement, and a joint structure associated with said axially rotatable switch blade part, said joint structure comprising a pair of joint members one of which is fixed to said axially rotatable switch blade part and the other of which is provided with a rotatably supported shank portion, said joint structure having a pivot for pivotally connecting said joint members which in one position of said axially rotatable switch blade part is offset relative to said pivot means which pivotally connects said supporting switch blade part to said stationary member so as to prevent pivotal movement of the switch blade and which in another position of said axially rotatable switch blade part is aligned with said pivot means so as to permit pivotal movement of said switch blade.

OLAV FROLAND.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
2,179,539	Bowie	Nov. 14, 1939
2,303,119	Froland	Nov. 24, 1942
2,226,818	Henrich	Dec. 31, 1940