Dec. 2, 1941. E. SCHEUERMEYER 2,264,862

ELECTRIC SWITCH

Filed Jan. 10, 1940 2 Sheets-Sheet 1

Fig.1.

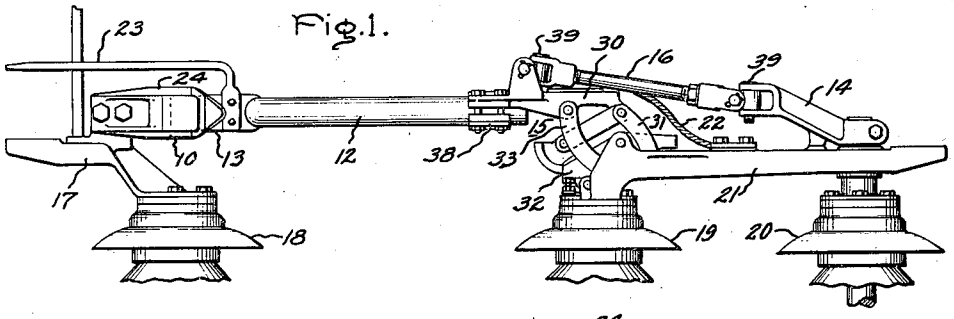

Fig.2.

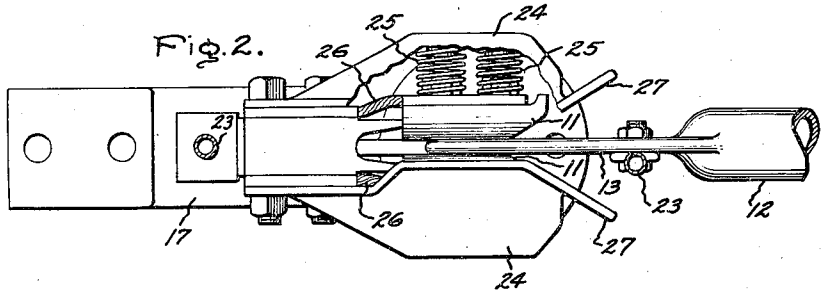

Fig.3.

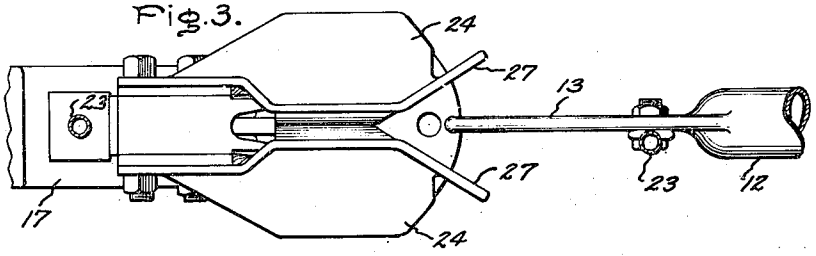

Fig.4.

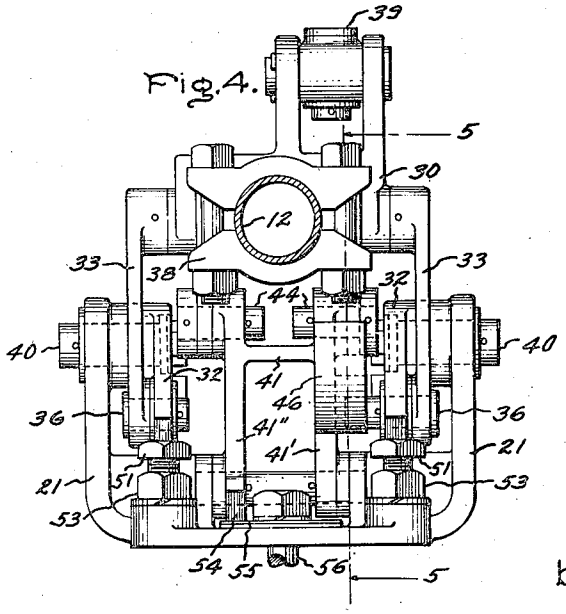

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Fig. 5.

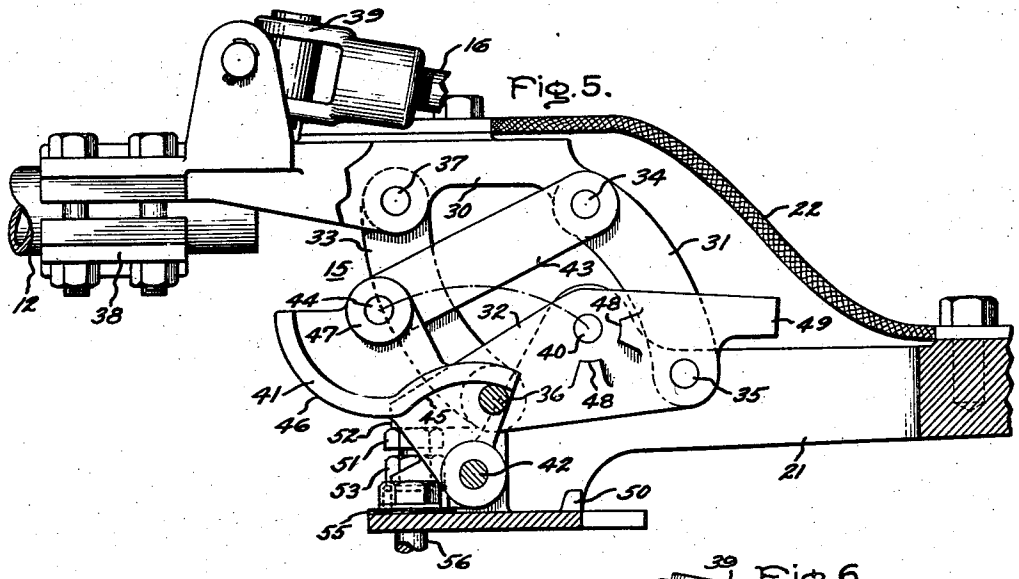


Fig. 6.

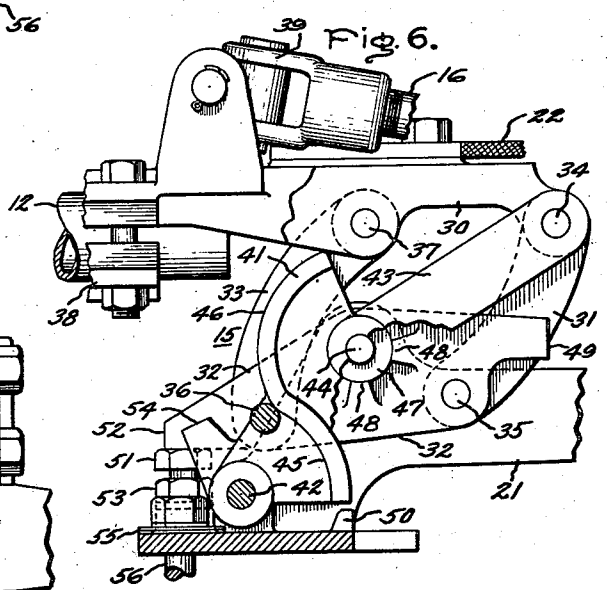
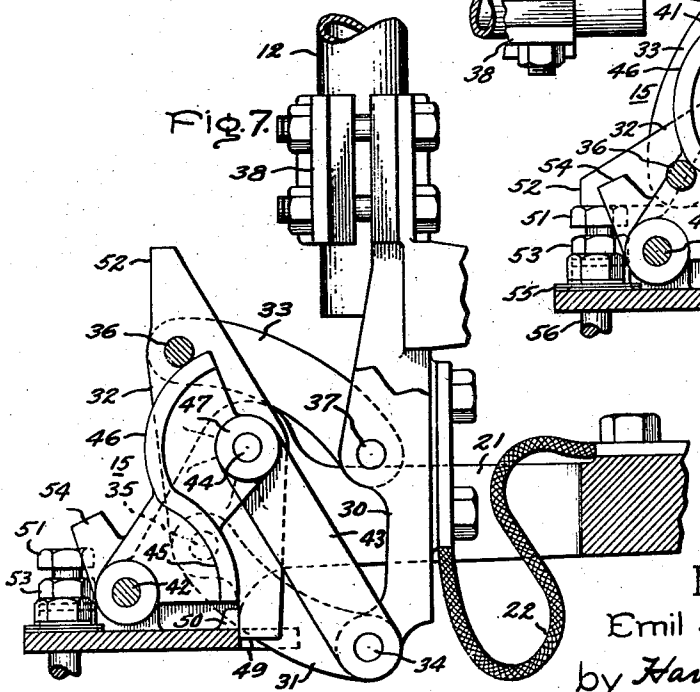


Fig. 7.



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Patented Dec. 2, 1941 2,264,862

UNITED STATES PATENT OFFICE

2,264,862

ELECTRIC SWITCH

Emil Scheuermeyer, Upper Darby, Pa., assignor to General Electric Company, a corporation of New York

Application January 10, 1940, Serial No. 313,208

8 Claims. (Cl. 200—48)

My invention relates to improvements in electric switches and more particularly switches of the type wherein successive translatory and rotary movements of a movable circuit controlling member are effected by a continuous movement of an operating member.

In pillar insulator mounted disconnecting switches of the rotatable blade and cooperating stationary jaw contact type especially for high voltages and high contact pressures, the engagement and separation of the blade and jaw contact particularly when there is any tendency for them to stick because of corrosion, current welding, sleet and ice formations, etc., are likely to impose on the insulators, usually of ceramic material, bending and torsional stresses which they are inherently ill adapted to sustain. In order to reduce the severity of the duty on the insulators as well as other parts of such switches, it has been proposed that in the circuit-opening operation of the switch the blade be first withdrawn from its cooperating stationary contact in a substantially straight line motion and then rotated to provide the clear break necessary for the voltage of the circuit. The circuit-closing operation is in the reverse order; that is, blade rotation and then translation.

One object of my invention is to provide an improved and simplified electric switch mechanism for obtaining such translatory and rotary blade actuations with one continuous movement of an operating member.

Another object of my invention is to provide an electric switch mechanism for obtaining a positive and definite transition between the two movements whereby to insure that the blade is correctly aligned with the stationary contact prior to engagement therewith.

A further object of my invention is to provide an improved electric switch mechanism with means for simply and readily adjusting the transition point between the rotary and translatory movements.

These and other objects of my invention will appear in more detail hereinafter.

My invention will be better understood from the following description when considered in connection with the accompanying two sheets of drawings, and its scope will be pointed out in the appended claims.

In the accompanying drawings

Fig. 1 is a side elevation of a blade and jaw type of electric switch embodying my invention;

Fig. 2 is a top plan view to an enlarged scale with parts broken away illustrating the jaw contact with the blade positioned therein;

Fig. 3 is a view similar to Fig. 2 with the blade withdrawn from the jaw contact;

Fig. 4 is a vertical elevation of that portion of the switch mechanism mounted on the middle insulator of the switch shown in Fig. 1 as viewed from the left-hand insulator in Fig. 1;

Fig. 5 is an elevation partly in section on the line 5—5 of Fig. 4 showing the parts in the switch-closed condition;

Fig. 6 is an elevation similar to Fig. 5 showing the parts in position at the end of the translatory opening movement or the beginning of the translatory closing movement of the blade;

Fig. 7 is a view similar to Figs. 4 and 5 showing the parts in the full open position of the switch.

The electric switch shown in Fig. 1 for the purpose of illustrating my invention comprises a stationary contact means indicated generally by 10, a cooperating movable contact element, such as a tubular conductor 12, with a flattened end or blade 13 for entering the contact means 10, an operating member, such as a crank 14, a parallel motion mechanism carrying the movable contact element 12 and indicated generally by 15, and interconnecting means, such as a link 16, between the parallel motion mechanism 15 and the crank 14. As shown, the contact means 10 is mounted on a terminal insulator bracket 17 attached to a stationary supporting insulator 18. The rest of the switch mechanism is supported by a stationary insulator 19 and a rotatable insulator 20. At their upper ends these insulators are interconnected by a strut 21, which serves to keep them in alignment, supports the parallel motion mechanism 15, and carries a suitable bearing for the upper end of the rotatable insulator to which the crank 14 is suitably secured. The outer end portion of the strut 21 may also serve as the other terminal of the switch. The supporting insulators 18, 19 and 20 are mounted on a suitable base which is not shown but which, as will be apparent to those skilled in the art, may include a bearing for the lower end of the insulator 20. In order to insure a good conductive path between the strut 21 and the contact element 12, a suitable flexible connection 22 may be provided between these members. In those cases where the switch may be used to interrupt relatively small currents, such as magnetizing cur-

rents of transformer banks, arcing horns 23 may be provided.

As shown in Figs. 2 and 3, the stationary contact means 10 is of the full floating line pressure contact type comprising two opposed cylindrical contacts 11 respectively mounted in hood or shroud members 24. These house resilient means, such as springs 25, bias the contacts 11 toward each other. In order to insure a good conductive connection between the terminal bracket 17 and each of the contacts 11, they are interconnected by suitable flexible connections 26. In order to provide a guided entry of the blade portion 13 into the contacts 11, each of the hoods 24 may be provided with flanges 27 arranged to provide a V-shaped entering notch.

In accordance with my invention, I so construct the parallel motion mechanism 15 that it can function as a parallel motion device during a part of the movement of the operating member 14, but during the remainder of the movement of this member, it is effectively operative as a rigid member. Thus during that part of the movement of the operating member 14 in which the parallel motion mechanism 15 is operative, as such, translatory movement of the contact element 12 is effected but during that part of the movement of the operating member 14 in which the parallel motion mechanism is operative as a rigid member, the rotary movement of the contact element 12 is effected.

As will be more readily apparent from Figs. 4–6, inclusive, the parallel motion mechanism 15 comprises a plurality of relatively movable interconnected links 30, 31, 32 and 33. These may be pivotally interconnected by bearing pins 34, 35, 36 and 37, as shown. Also, as illustrated, the contact element 12 is suitably mounted, as by a clamping means 38, on one of the links 30 which may also be connected to the operating member 14 by the link 16 through universal joint means 39, as shown.

In order to secure the desired translatory and rotary movements of the contact element 12 by the parallel motion mechanism 15, I rotatably support one of the links 32 for angular movement in the plane of the mechanism. Thus, as shown, the link 32 is supported on a bearing pin or pivot 40 which is intermediate its pivotal connections 35 and 36 to the mechanism and which is supported by the strut 21. Further, in accordance with my invention, I so arrange to prevent movement of the link 32 during a part of the movement of the operating member 14 as to effect relative movement of the links of the mechanism, but on further movement of the operating member, to prevent relative movement of the links of the mechanism. Thus, for example, in the illustrated embodiment of my invention during that portion of the motion of the operating member in which translatory movement of the contact element 12 is desired, I provide means for preventing rotation of the link 32 about its bearing pin 40. Upon further movement of the operating member, however, during which rotary movement of the contact element 12 is to be effected, I provide means which prevents relative movement of the links of the parallel motion mechanism 15 but allows rotary movement of this mechanism as a unit about an axis, such, for example, as the pivot pin 40 on which the link 32 is mounted.

The means which I have shown for obtaining the desired relative and rigid movements of the links 31—33, inclusive, is a cam member 41 which is rotatably supported as on a bearing pin 42 mounted on the strut 21. This cam member is engageable with the parallel motion mechanism and so coupled thereto as to prevent movement of the link 32 during a part of the movement of the operating member 14 and during further movement thereof to prevent relative movement of the links 30—33, inclusive. For this purpose the coupling may comprise a link 43 extending between the bearing pin 34 and a point, such as a bearing pin 44, on the cam member 41. In order that the parallel motion mechanism may move as a unit about the axis 40 after the translatory movement of the blade has been completed in the circuit-opening operation of the switch, the center-to-center distance of the bearing pins 42 and 44 is made equal to the center-to-center distance of the bearing pins 40 and 42. Also, in order to obtain the desired relative and rigid movement of the parallel motion links, the cam member 41 has two cam portions or faces 45 and 46 providing a reversely curved configuration or outline against which the pin 36 bears. Thus, the cam face 45 is circular with its center in the axis of the pin 42. The radius of curvature of the cam face 45 is such as to engage the pin 36 and thereby prevent rotation of the link 32 as long as the cam face 45 is over the pin 36; in other words, during the translatory movement of the contact element 12. However, when the cam member 41 is rotated clockwise sufficiently for the pin 36 to move by the point of curvature reversal so as to engage the cam surface 46, as shown in Fig. 6, then, in accordance with my invention, the parallel motion mechanism can rotate as a rigid unit about the axis 40. At this point in the movement of the cam member 41 the bearing pin 44 is in line with the bearing pin 40, and the bearing boss 47 of the cam 41 engages or abuts stops 48 on the link 32 whereby to prevent further relative movement of this link and the cam member, the parts being positioned as shown in Fig. 6. Further movement of the operating member 14 now results in rotary movement of the contact element 12 as the pin 36 travels along or engages the cam surface 46 since the parallel motion mechanism is now locked and can move only as a unit about the axis 40. Such unitary motion continues until the parts come to the position shown in Fig. 7 wherein the motion is limited by the end 49 of the link 32 abutting suitable means, such as a stop 50 on the strut 21. In the switch-closing movement the operation just described is, of course, in reverse order from the position shown in Fig. 7 to Fig. 6, where the translatory movement starts, to the position shown in Fig. 5, where the translatory movement ends on the switch-closing movement.

Since it is important that the blade end 13 of the contact element 12 be rotated to the desired alignment with the stationary contact jaws before the translatory movement is started, it is preferable to have a stop for limiting the counterclockwise rotation of the parallel motion mechanism as a unit. This may be accomplished by placing a stop 51 in the path of movement of the end 52 of the link 32. In order to allow for manufacturing tolerances and lost motion, especially where a number of pivotal points are involved, and yet be able to control the transition between the translatory and rotary movements of the blade, relatively to the movement of the operating member, I adjustably position the stop 51. Thus, as shown, the stop 51 may be a stud screwed into the strut 21 to the desired position

and suitably secured against relative movement thereto by a lock nut 53 as more clearly appears in Fig. 4.

While the parallel motion mechanism may be thought of theoretically as comprising elements which have only one dimension, that is, length, and operating in the same plane it is, of course, obviously impossible to make these elements without thickness so that to a certain extent they have to be offset from each other. In order to maintain symmetry of structure with better distribution of loads so as to avoid cramping and undue friction, certain parts of the mechanism may be duplicated, as shown in Fig. 4. However, for practical purposes I have found that it is not necessary to duplicate the cam portions on the member 41. Thus, as shown in Fig. 4, while the cam member 41 is shown as comprising two interconnected portions 41', 41'', only the portion 41' is provided with the cam faces 45 and 46. In order to limit the translatory movement in switch closing direction, the portion 41'' of the cam member 41 may be provided as shown more clearly in Fig. 4, with a tail or stop portion 54 which abuts the strut 21 in the closed position of the switch. The stop position of this cam member can readily be varied by means of suitable shims, such as washers 55, mounted under the head of one of the cap screws 56 which secures the strut 21 to the cap of the insulator 19.

While I have shown and described my invention in considerable detail, I do not desire to be limited to the exact arrangements shown, but seek to cover in the appended claims all those modifications that fall within the true spirit and scope of my invention.

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

1. An electric switch comprising a movable contact element, an operating member, and means for effecting successive rotary and translatory movements of said contact element by a continuous movement of said operating member comprising a parallel motion mechanism having a plurality of relatively movable interconnected links, means for preventing relative movement of said links during a predetermined portion of the movement of said operating member subsequently operative during further predetermined movement of the operating member to permit relative movement of the links of the mechanism, including means actuated in dependence on the movement of one of said links, and means for changing the point in the movement of the operating member at which transition from rotary to translatory movement of the contact element occurs.

2. An electric switch comprising relatively movable cooperating contact elements, an operating member, and means for effecting successive translatory and rotary movements of one of said contact elements by a continuous movement of said operating member to cause a change in the circuit controlling condition of said contact elements comprising a parallel motion mechanism having four pivotally interconnected links to one of which said operating member is connected, means pivotally supporting another of said links at a point intermediate its pivotal connections in the mechanism for angular movement in the plane of the mechanism, a rotatably mounted member having a reversely curved cam, said cam member being coupled to said mechanism and movable thereby during a part of the movement of said operating member to prevent movement of said other link whereby to effect relative movement of the links of the mechanism and on further movement of said operating member to prevent relative movement of the links of the mechanism.

3. An electric switch comprising a movable contact element, an operating member, and means for effecting successive translatory and rotary movements of said contact element by a continuous movement of said operating member comprising a parallel motion mechanism having a plurality of relatively movable interconnected links to one of which said operating member is connected, means rotatably supporting another of said links for angular movement in the plane of the mechanism, a rotatably mounted member having a reversely curved cam engageable with said mechanism, said cam member being coupled to said mechanism and movable thereby during a part of the movement of said operating member to prevent movement of said other link whereby to effect relative movement of the links of the mechanism and on further movement of said operating member to prevent relative movement of the links of the mechanism, and means for controlling the point in the movement of the operating member at which the curvature engagement of the cam with the mechanism is reversed.

4. An electric switch comprising relatively movable cooperating contact elements, an operating member, and means for effecting successive translatory and rotary movements of one of said contact elements by a continuous movement of said operating member to cause a change in the circuit controlling condition of said contact elements comprising a four link parallel motion mechanism which supports said one contact element and to which said operating member is connected, means supporting one of the links of said mechanism at a point intermediate its connections in the mechanism for angular movement in the plane of the mechanism, and means for preventing movement of said one link during a part of the movement of said operating member whereby to effect relative movement of the links of the mechanism operative on further movement of the operating member to prevent said relative movement of the links of the mechanism.

5. An electric switch comprising relatively movable cooperating contact elements, an operating member, and means for effecting successive translatory and rotary movements of one of said contact elements by a continuous movement of said operating member to cause a change in the circuit controlling condition of said contact elements comprising a parallel motion mechanism having four pivotally interconnected links to one of which said operating member is connected, means pivotally supporting another of said links at a point intermediate its pivotal connections in the mechanism for angular movement in the plane of the mechanism, a rotatably mounted member having a reversely curved cam engageable with said other link, a coupling link pivotally connected to said cam member at a distance from its axis of rotation substantially equal to the distance between said axis and the pivotal axis of support of said other link, said coupling link being pivotally connected to said mechanism.

6. An electric switch comprising a movable contact element, an operating member, and means for effecting successive translatory and rotary movements of said contact element by a continuous movement of said operating member comprising a parallel motion mechanism having

a plurality of relatively movable interconnected links to one of which said operating member is connected, means rotatably supporting another of said links for angular movement in the plane of the mechanism, a rotatably mounted member having a reversely curved cam engageable with said mechanism, said cam member being coupled to said mechanism and movable thereby during a part of the movement of said operating member to prevent movement of said other link whereby to effect relative movement of the links of the mechanism and on further movement of said operating member to prevent relative movement of the links of the mechanism.

7. An electric switch comprising a movable contact element, an operating member, and means for effecting successive translatory and rotary movements of said contact element by a continuous movement of said operating member comprising a parallel motion mechanism having a plurality of relatively movable interconnected links to one of which said operating member is connected, means rotatably supporting another of said links for angular movement in the plane of the mechanism, a rotatably mounted member having a reversely curved cam engageable with said mechanism, said cam member being coupled to said mechanism and movable thereby during a part of the movement of said operating member to prevent movement of said other link whereby to effect relative movement of the links of the mechanism and on further movement of said operating member to permit rotation of said other link about its support whereby to prevent relative movement of the links of the mechanism, and means for adjustably positioning said other link to control the point in the movement of the operating member at which rotation of said other link becomes possible.

8. An electric switch comprising a movable contact element, an operating member, and means for effecting successive translatory and rotary movements of said contact element by a continuous movement of said operating member comprising a parallel motion mechanism having a plurality of relatively movable interconnected links to one of which said operating member is connected, means rotatably supporting another of said links at a point intermediate its connections in the mechanism for angular movement in the plane of the mechanism, means for preventing relative movement of the links of said mechanism during a part of the movement of said operating member, means for permitting during the remainder of the movement of the operating member relative movement of the links of the mechanism including means for holding said other link against movement, and means for changing the point in the movement of the operating member at which said other link is held.

EMIL SCHEUERMEYER.