March 14, 1933. G. A. MATTHEWS 1,901,607

OUTDOOR SWITCH CONTACT

Original Filed Jan. 18, 1929

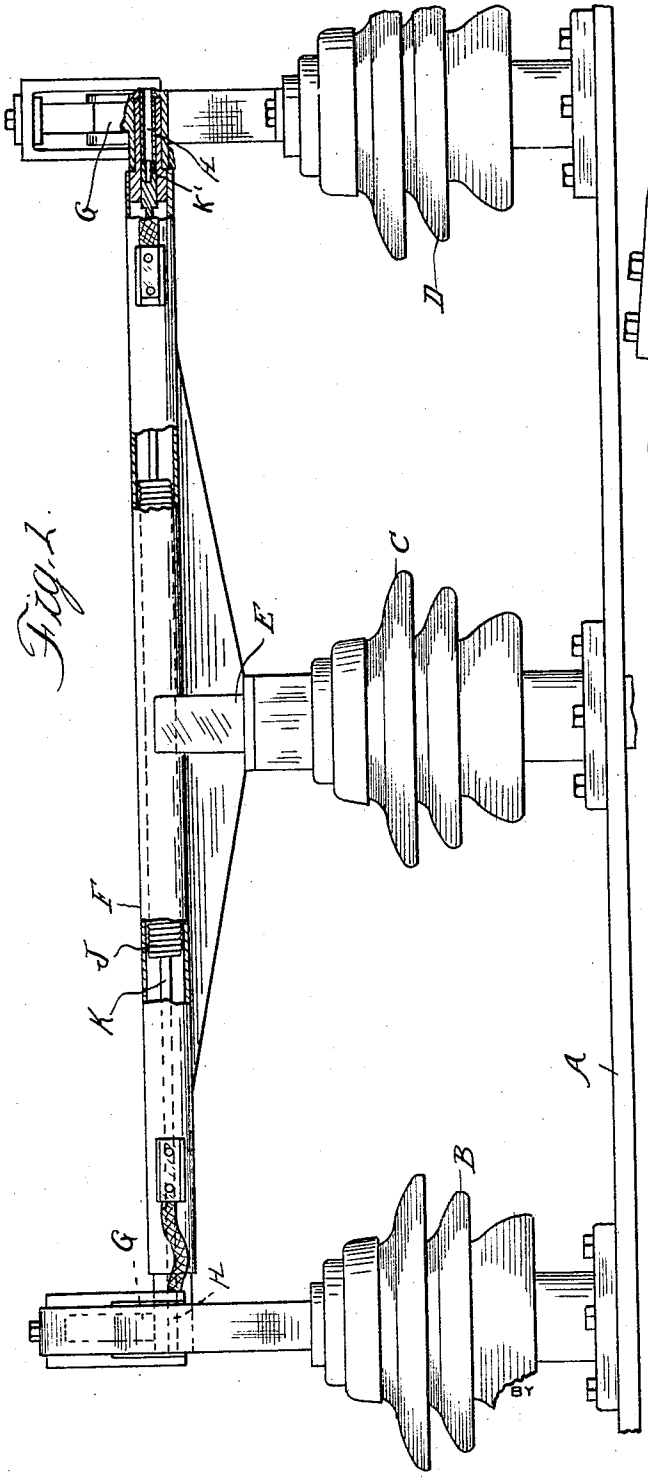


Fig. 1.

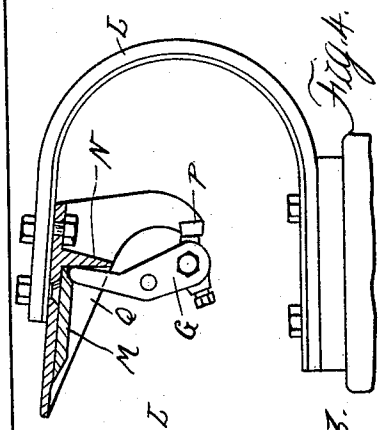


Fig. 4.

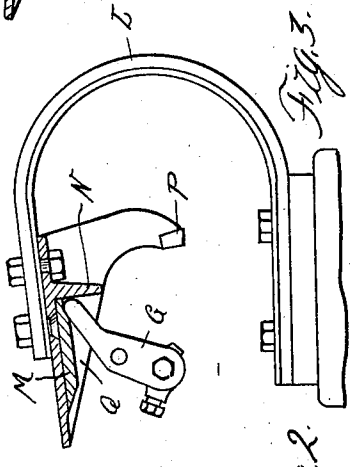


Fig. 3.

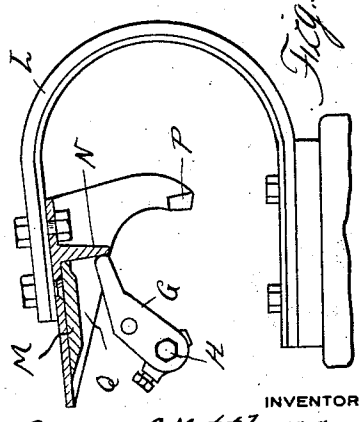


Fig. 2.

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UNITED STATES PATENT OFFICE

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OUTDOOR SWITCH CONTACT

Original application filed January 18, 1929, Serial No. 333,362. Divided and this application filed May 31, 1930. Serial No. 458,862.

This invention relates to mechanism for affording and maintaining a high degree of efficiency in the contact surfaces of outdoor electrical circuit switches, and has for its object an improved organization of parts, each operation of which, closure or opening, involves such a scraping or sliding movement of the parts relative to one another as will act to break up any corrosive accumulation or similar deposit upon the surface of the parts thus brought into contact which might otherwise impair effective electrical contact between the surfaces and which will at the same time permit the easy opening and closing of the switch parts without undue mechanical resistance.

Since such mechanisms are generally mounted upon exposed poles or other structural supports, without protection against sleet and similar weather conditions, it is obvious that the parts of such a mechanism must be so arranged and correlated that not only will they function positively and reliably as regards the movement of the terminals into and out of contact with one another, but as well that such movement most of itself and automatically revolve and effect such a scraping or rubbing movement of the parts as has been above remarked upon, and for many uses this in turn makes it advisable to so position the last one of the contact parts that its intendedly exposed surface will face downwardly, thus being protected from the weather in the same manner that the underside of a roof of an otherwise open structure would be at least partially sheltered.

In view of the diverse constructions for effecting these desired proportions shown in my now pending application Serial No. 333,362, filed January 18, 1929, it has seemed advisable to make the subject matter of certain of the constructions therein shown the subject of this separate and consequently divisional application.

In the drawing:

Figure 1 is a side elevational view of a preferred form of disconnecting switch peculiarly adapted to use cooperatively with the relatively fixed contact members whose details form the subject matter of this application.

Figure 2 is a side elevational view partly in section of one of the relatively fixed contact members with the contact arm from the swinging switch piece shown in initial operative relation thereto.

Figure 3 is a view similar to Figure 2 showing the parts in an intermediate stage of operative movement relatively to one another.

Figure 4 is a similar view showing the parts in fully contacting positions.

A indicates a suitable supporting structure, such as a channel bar, whereon are mounted three insulators, as B, C, and D, the center insulator C carrying an axially rotatable rod E whereon is mounted the switch arm F, which is preferably tubular and has at each end a contact finger G carried on the pin or rod H in a way to be capable of limited rotative movement with respect to the tubular part F. A coil spring J positioned in the center portion of the tubular swinging arm F acts to pull each contact finger to the relatively depressed position shown in Figure 2, this being the normal inoperative position thereof. The coil spring J is connected to each finger by a rod K, the outer portion of which fits into a socket K' on the outer end of the tube, and this socket may be utilized, when the parts carried by the tube F are being assembled, as a hold for a wrench or similar turning instrument, for the purpose of providing such initial tention upon the spring J as may be needed.

Each one of the outer insulators B and D carries a horse shoe or U-shaped spring L, one leg of which is suitably attached to the insulator, while the other leg extends thereover and adjacent the contact finger G already remarked upon as supported by the tubular swinging arm F. Upon the over-engaging end of the U-shaped spring L is preferably bolted or similarly secured an initially separate contact plate M, whose surface is adapted to be wipingly engaged by the end of the contact finger G as the arm F is swung, so that the terminals of each of

the fingers G can thus engage such part of its corresponding one of the relatively fixed contact elements L. The ends of each of the contact pieces G initially engage the depending abutment part N as shown in Figure 2, but as the closing movement of the switch continues, the end of the finger G moves upwardly along the left-hand surface of the abutment N as viewed in Figures 2, 3, and 4 against the resistance of the spring J within the arm F, and soon strikes the contact plate M already mentioned, along which it wipingly moves, thus forcing the top or freely swinging leg of the U-shaped part L upward. In the position shown in Figure 3 this described movement is just about to begin, the end of the contact finger G resting in an angle bounded by the contact plate M and the surface of the abutment N. The continued turning of the contact finger G about the axis of the swinging arm F as a center of movement effects a sort of knuckle turning of the rounded end thereof along and relatively to these surfaces. The thus positively induced movement thereof is yieldingly opposed by the resilient character of the U-shaped contact piece L. As the upper or overengaging leg of this is thus forced upwardly, it attains a sufficiently varied angle from the initial or unactuated position—compare Figures 2 and 4—so that the terminal projection P on the lower end of the web of the plate M, of which the abutment N is also a part and which initially is quite appreciably separated from the hub or inner end of the contact piece G, is constantly swung toward the position of contact, shown in Figure 4; a comparison of the positions of these parts as shown in Figure 2 and in Figure 4 will show that the attainment by the end of the contact piece G of this last-described position has involved its swing past its "dead center", measured along the axial length of the piece G, thus resiliently though with adequate firmness locking the parts in the then attained position.

When the parts have been thus swung and their relative movement effected in the manner indicated, not only has a wiping or scraping movement of the downwardly facing surface of the part M been accomplished, but also a scraping or rubbing of the rounded end of the swinging contact finger G as well, due to the resiliency of the fixed abutment member L. The final position attained by these parts and indicated in Figure 4 causes a continued compressive strain which holds the parts firmly in desired relation and against undesired displacement during the time that the closure position of the switch arm is desired to be maintained in full efficiency. Moreover, the raising of the overengaging upper leg of each resilient though fixed contact piece L, increases the space between the two legs of the latter and provided adequate space for the swing of the contact finger, regardless of what accumulation of ice or sleet may have taken place on the lower leg of the spring or upon the top of its supporting insulating cap B or D. All of the engaged contact surfaces of the parts M and N being presented downwardly for the action of the contact finger against them, are protected amply by the skirting or shell formation indicated at Q which thus acts as a lateral protection against horizontally driven sleet or ice particles.

It will of course be obvious that variant structural forms of the swinging tubular arm and its supported parts may be resorted to, without departure from the fair an intended spirit of this disclosure, the central feature of which is the downwardly facing or roof-protected positioning of the contact surfaces which are designed to be scraped or cleared by the rubbing of the rounded end of the contact arm G, including as well, the beneficial structural features made possible by the contouring and positioning of the resilient U-shaped element L as a whole.

What I claim is:

1. In a switch, a rotatably mounted rigid arm carrying a conductor pivoted on the end thereof, a yieldably mounted conductor located at a suitable point for contact against a downwardly-facing surface thereof by the conductor on the end of said arm upon rotation thereof, further rotation of said arm rotating said pivotally mounted conductor against yielding pressure of the mounting for said other conductor whereby extraneous matter is ground away and proper electrical contact established, said pivoted conductor upon said arm swinging past the vertical line through the points of contact upon said yieldably mounted conductor, whereby said yielding means tends to continue rotation of said arm, and a stop for said arm immediately beyond said vertical line whereby a locking means is provided for said conductor.

2. In a switch, a rotatably mounted rigid arm carrying a conductor pivotally mounted on the end thereof, a second conductor yieldably mounted at a suitable distance for contact by said first named conductor, a shroud for said second conductor comprising a roof, side walls and a back plate angularly disposed to said conductor, said pivotally mounted conductor upon rotation of said arm sliding along said back plate upon approaching said second conductor, said second conductor and said shroud yielding against further rotation of said arm after contact of said conductors, said pivoted conductor rotating against said shrouded conductor during yielding of said shrouded conductor whereby a proper electrical contact is insured, said yielding means tending to continue ro-

tation of said arm as the pivot of said first conductor passes the dead center line through the points of contact with said shrouded conductor, and a stop beyond said dead center line whereby said arm is maintained against said stop by said yielding means, and whereby contact between said conductors is maintained.

3. In a switch, a plurality of conductors, one of said conductors being swingable to establish a line contact with the other of said conductors which latter though limitedly resilient is fixed in location, further movement of said swingable conductor rotating the contacting end thereof against a downwardly-facing surface on said second conductor whereby the surfaces of said conductors frictionally grind away all extraneous matter therebetween to establish a good electrical connection, and a stop for limiting the throw of the first named of said conductors in such contacting position.

4. In a switch, a plurality of conductors, one of said conductors being fixedly positioned though slightly yieldable, the other of said conductors being pivotally mounted on an arm, a spring in said arm connected to said pivoted conductor, rotation of said arm establishing a line contact between said pivotally mounted conductor and said last-named conductor, further rotation of said arm rotating the end of said pivotally mounted conductor against and along a downwardly facing surface upon said other conductor and against torsion of said spring whereby a gradually increasing pressure is exerted between said surfaces, and a stop for maintaining the contact established between the surfaces of said conductors after said first-named conductor has passed the point of maximum frictional engagement against said second contact.

5. In a switch, in combination with a rotatably mounted rigid arm provided with terminally located conductor elements, a pair of cooperable conductor elements positioned at points suitable for engagement by the terminal elements on said rigid arm when the latter is swung to position of engagement with said last named conductor elements, each of said latter comprising a slightly resilient member of generally U-shaped contour, an anchored insulating support to which one leg of said U-shaped member is attached, and a supplemental piece fixed to the other leg of the U-shaped member in position to present a downwardly facing contact against which the end of the adjacent terminal conductor element on said rigid arm wipingly engages as the latter is rotatively actuated, thereby flexing the supporting U-shaped member to a degree sufficient to throw into engagement with its adjacent terminal conductor element a projecting stop portion of said supplemental piece which is normally out of contact therewith.

6. In combination with a relatively rigid arm, rotatable contact members supported at the ends thereof, means insulatedly supporting said rigid arm in position of possible swing in a substantially horizontal plane, and a pair of insulatedly supported fixed though slightly resilient contact members adapted to be engaged by their adjacent rotatable contact members on said rigid arm when the latter is suitably actuated, each of said fixed contact members being of substantially U-shaped contour and carrying on one branch a downwardly facing prepared surface against one portion of which the end of its corresponding rotatable contact member is adapted to wipingly engage, and with which another portion of said resilient contact member is adapted to be brought into engagement upon the completion of the wiping movement of its rotatable contact member relatively thereto, after overcoming the resistance of the fixed though resilient contact member to the progress of said wiping movement.

7. A switch, comprising, in combination with a rotatably supported swinging arm, and a relatively movable contact member carried on each end of said swinging arm, a pair of fixed though adequately resilient contact elements located in positions of potential contact by the contact members on said swinging arm, each comprising an insulatedly supported U-shaped member and a downwardly facing supplemental piece carried on one branch of said U-shaped member, against a selected portion of which the corresponding contact member on said swinging arm is adapted to wipingly engage against the resilient resistance thereto afforded by said U-shaped member, and by a normally spaced portion of which latter a portion of the corresponding contact member on said swinging arm is adapted to be engaged upon the completion of its described wiping contact movement.

8. In a switch, in combination with a relatively rigid arm supported in position of potential swinging movement in a horizontal plane, and relatively movable contact members carried on the ends of said arm, fixedly positioned contact pieces adapted to be engaged by said relatively movable contact members when said arm is appropriately swung, each comprising an insulatedly supported and slightly resilient U-shaped member, and a supplemental contact piece supported thereby in downwardly facing position, adapted to be wipingly engaged by its corresponding movable contact member on said swinging arm, and such supplemental piece having a projection which though initially out of engagement with its corresponding movable contact member on said swinging arm is lockingly brought into engagement

therewith at the end of the wiping movement of the latter along the downwardly facing surface of such supplemental piece.

9. In a switch, the combination, with a horizontally swingable and relatively rigid arm provided with relatively movable contact pieces at the ends thereof, of fixedly located U-shaped contact elements adapted to be engaged by said relatively movable contact pieces upon the appropriate swing of said relatively rigid arm, one branch of each of said U-shaped contact elements being provided with a downwardly facing contact surface adapted to be wipingly engaged by its corresponding movable contact piece on said swinging arm and to thereafter lockingly engage the latter with a projecting branch thereof after the described swinging movement of its movable contact piece on the rigid arm has passed the line of maximum resilient opposition to its wiping travel along said downwardly facing contact surface.

In testimony whereof I sign this specification.

GEORGE A. MATTHEWS.