Feb. 27, 1934. C. G. KOPPITZ 1,949,164

HIGH TENSION SWITCH

Original Filed Nov. 12, 1928

Fig. 2.

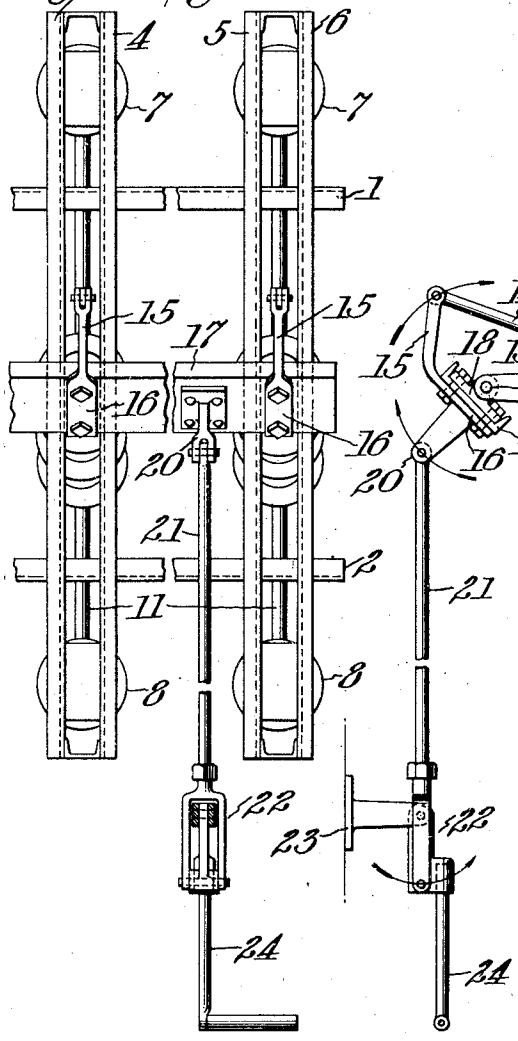


Fig. 1.

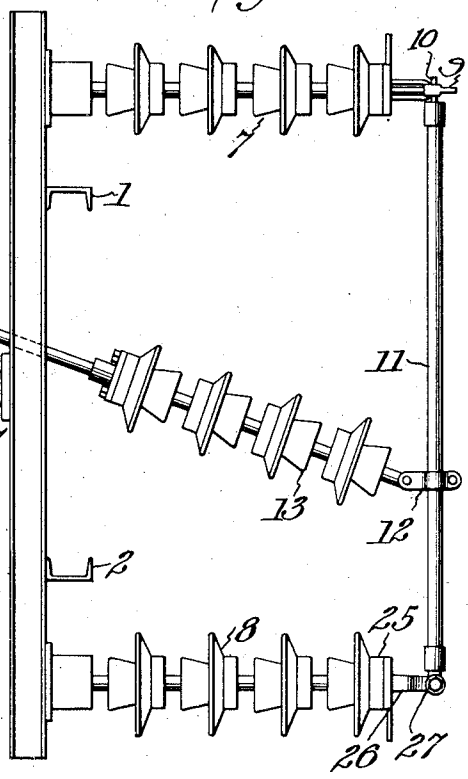
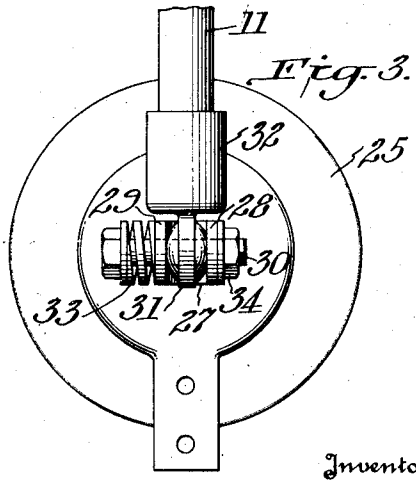


Fig. 3.



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HIGH TENSION SWITCH

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Original application November 12, 1928, Serial No. 318,962, now Patent No. 1,935,597, dated November 14, 1933. Divided and this application April 15, 1930. Serial No. 444,580

9 Claims. (Cl. 200—48)

This invention relates to high tension electrical switches particularly adapted for outdoor service. More particularly, the invention relates to a switch of the pivoted insulator type in which the operating mechanism is disposed on the opposite side of the pivot from the insulator and switch blade to assist in counterbalancing the weight of the latter members.

Another object of the invention is to provide a switch of the character aforesaid wherein the weight of the insulator and switch blade is counterbalanced by the arrangement of the operating mechanism on the opposite side of the pivot.

Still another object of the invention is to provide switching apparatus comprising a plurality of switches of the pivoted insulator type joined by a common member for simultaneous operation wherein the weight of the switch blades and insulators is counterbalanced by the weight of the common member and the operating mechanism.

Other objects will be apparent from the following description when taken in connection with the accompanying drawing, wherein:

Fig. 1 is a side elevational view of an embodiment of the invention,

Fig. 2 is an end elevational view of the same device, and

Fig. 3 is an enlarged view of a constructional detail.

Referring to the drawing, two horizontally disposed channels 1, 2 support vertically disposed channels 3, 4, 5, 6 which are arranged in pairs, having their webs facing one another, there being one such pair of channels for each switch. Each pair of channels has rigidly mounted thereon two parallel, spaced, insulator columns 7, 8, one column 7 having mounted on its free end a switch jaw 9 such as is shown and described in applicant's Patent No. 1,935,597 issued Nov. 14, 1933, of which this application is a division. A cooperating contact element 10 is supported by a blade 11 for angular movement about an axis at the end of the insulator column 8.

Rigidly secured to a point on the switch blade 11 intermediate the ends is a clamp member 12 to which is hinged one end of a third insulator column 13. Secured to the other end of the insulator column 12, and in axial alinement therewith, is an operating rod 14 which passes between the pair of channels.

Pivotally secured to the end of the operating rod is one arm of a crank 15, the other arm 16 of which is rigidly supported on a channel member 17 which is supported on lugs 18 carried by the vertical channel members. The supporting means for the movable channel comprises a plurality of axially alined pivot members 19, there being one pivot member with its cooperating lug for each switch in the group.

The movable channel member 17 serves as a means for connecting any desired number of switches forming the switch group, whereby they may be simultaneously operated by a single operating means.

The movable channel member carries, preferably midway between its ends, a lug 20 to which is pivotally connected the main operating rod 21, which rod has one end connected by a linkage 22 to a stationary member 23. An operating handle 24 is provided for the convenient operation of the linkage. Particular attention is directed to the fact that the member 17 or common operating bar for the several switches is eccentrically mounted by the pivots 19 and that its dead weight as well as that of the operating rod tends to move the switch blades towards closed position. The dead weight of the several blades 11 and insulator columns 13 tends to move the switch blades to open position throughout substantially the full arcuate travel of the blades. The linkage is preferably so designed, as illustrated in Fig. 1 that the pivotal ends of the cranks 15 pass to the left of the vertical plane through the pivot members 19 just prior to the final closing movement of the blades, thus yieldingly locking the blades against accidental opening by causing the weight of the insulator columns 13 to supplement the weight of the common bar 17 in tending to retain the switch blades in closed position.

The pivotal connection between the insulator column 8 and the member 11 which supports contact 10 is preferably of the high pressure contact type, and one appropriate form is shown in Fig. 3. Mounted on the end insulator 25 of the insulator column 8 is a lug 26 having a bifurcate end 27 provided with somewhat flexible arms 28, 29. Pivotally mounted between the arms by means of a bolt 30, is a contact member 13 of hard bronze having hemispherical faces and forming an integral part of a blade socket 32 secured to one end of the switch blade. The arms 28, 29 of the lug which are formed of copper are forced against the hemispherical faces of the pivot member by means of a compression spring 33 surrounding the pivot bolt 30, the compression being obtained by tightening a nut 34 on the end of the bolt 30.

In the above described high pressure contact there is provided a relatively hard metal in firm

engagement with a relatively soft metal over an exceedingly small area, whereby the pressure per unit of area is relatively high. The intimate contact between the surfaces produced by the use of hard and soft metal and by the high pressure contact provides an electrical connection which will carry very high currents without unsatisfactory heating thereof. The necessity of providing flexible shunts or jumpers is therefore eliminated.

Prior to the present invention, the practice in regard to contact surfaces has been to design apparatus for a pressure between contact surfaces of a few pounds per square inch. The current density found allowable when such low contact pressures were used was of the order of 50 to 80 amperes per square inch so that when heavy currents were to be carried, a very large contact area was necessary.

In the present high pressure contact apparatus, a total pressure of the order of 25 to 75 pounds is provided. However, the area of contact between the two adjacent contact surfaces is so very small that the pressure per square inch is extremely high. It is possible, with such a high pressure contact as described above to obtain satisfactory operation with a current density of the order of 25,000 amperes per square inch.

It will be seen that if the switch is in its closed position, an upward movement of the operating handle (as shown by arrows on the drawing) will effect such movement of the upper end of the main operating rod as will cause the movable channel to be rotated around the axis of the pivotal supports 19. Thus the cranks, carried by the movable channel, will be rotated to move the ends of the operating rods nearer to the fixed channels, which movement will cause the operating rods 14 to push the movable insulator columns 13 away from their fixed channels to thereby swing the switch blades 11 to their open positions.

It will be apparent that since the main operating rod, the movable channel, and the several cranks are disposed on the side of the pivot, opposite the several operating rods, movable insulator columns and switch blades, the latter will be counterbalanced by the former and the operation of the switches will require but little force since substantially the only force required is that necessary to overcome the friction of the contacting members. During the initial opening movement of a multiple switch, such as illustrated, in which the weight of the insulator columns is employed to provide a yielding lock, this counterbalancing is not effective but the power required for operation of the switch is still materially less than in prior constructions, since the relatively small movement of the insulator columns during the unlocking phase corresponds to a much greater travel of the operating handle 24.

It should also be apparent that inasmuch as the movable channel carries the torsional stress between the main operating rod and the several cranks, the pivot members are subjected to no torsional stress but are required to carry only the weight of the various members.

It will be apparent that the invention is not limited to the particular switch structure which is shown in the accompanying drawing, but is applicable generally to switches of the rocking insulator column type.

I claim:

1. A multiple pole switch of the type including a plurality of switches, each switch including a movable contact, and means pivotally mounting the same for arcuate movement, the weight of the mounting means tending to move the contact into open position during a predetermined portion of the arcuate movement thereof, and operating means for all of said switches, said operating means including a bar mounted for rocking movement about an axis parallel to the axis of movement of said contacts, characterized by the fact that said bar is eccentrically mounted to counterbalance a portion of the weight of said mounting means.

2. In a multiple pole switch, the combination with a plurality of switches each having a stationary insulator supporting a contact element, a movable contact, means including an insulator column for moving said movable contact along an arcuate path about a pivot point to carry the contact into and out of engagement with its corresponding contact element, the dead weight of said means tending throughout substantially the entire arcuate travel of the associated contact to rotate the same about its pivot point, of operating mechanism for simultaneously actuating all of said means, said mechanism comprising a bar extending laterally of said means, a crank arm connecting said bar to each of said insulator columns for actuating the same, and pivot members eccentrically mounting said bar to counterbalance a portion of the dead weight of said means throughout substantially the entire arcuate travel of said contacts.

3. In a multiple pole switch, the combination with a plurality of switches each including an insulator column carrying a contact element, a movable contact cooperating with each contact element, supporting means for said movable contact, and means providing alined pivotal supports at corresponding ends of each supporting means, whereby the weight of each supporting means tends to rotate the same about its pivotal support, of an operating member extending along said switches, operating connections between said member and each supporting means, pivotal members supporting said operating member for rocking movement, and means for rocking said operating member, said pivotal members eccentrically supporting said operating member for rocking movement along a path throughout which the weight of the operating member counteracts the rotative tendency of the said supporting means.

4. In a multiple pole switch, the combination with a plurality of switches, each switch including a pair of horizontal insulator columns in vertical alinement, means supporting corresponding ends of said columns, a contact on one column and a switch blade pivoted to the other column of each pair, and an insulator column pivoted at one end to an intermediate portion of each blade, of a common operating bar for all of said switches, operating arms rigidly secured to said bar and pivotally connected to the respective opposite ends of the pivoted insulator columns, pivot members eccentrically mounting said bar to counterbalance the weight of said pivoted insulator columns, and means for rocking said bar about said pivot members.

5. In a multiple pole switch, the invention as claimed in claim 4, wherein the pivot ends of said operating arms pass through a vertical plane just prior to the final closing movement of

said switch bars, whereby the switches are yieldingly locked in closed positon by the weight of said pivoted insulator columns.

6. A multiple-pole switch of the type including a plurality of substantially identical switch units, each unit including a fixed contact, a movable contact carried by a pivotally supported blade member, and an operating member for the blade member, the weight of the said members of each switch unit tending to rotate the blade member towards open switch position during a predetermined portion of the pivotal movement thereof, and a common operating means for all of the operating members of the said switch units, said operating means including a bar mounted for rocking movement, characterized by the fact that said bar is eccentrically mounted to counterbalance a portion of the weight of the said members of each switch unit.

7. A multiple-pole switch comprising a plurality of similar switch units; each unit including a contact, a second contact carried by a pivotally mounted blade, and a member for operating said blade to open and to close the said switch unit contacts, said blade and operating member being so arranged that the weight thereof tends to move said blade in opposite senses at the beginning and at the end of a pivotal movement of the blade to close the switch unit contacts; and means for actuating the operating members of all of said switch units, said actuating means including a bar and means eccentrically mounting the same for rocking movement, the weight of said bar counteracting a portion of the combined weights of the said blades and operating members of all of said switch units during at least a portion of the pivotal movement of the said blades.

8. A switch as claimed in claim 7, wherein the weight of the blade and operating member of each unit tends to move the blade to closed position at the end of a switch-closing movement of the blade and to move the blade to open position during the remaining major portion of the pivotal movement of the blade, and the weight of said bar opposes the tendency of the combined weights of all of said blades and operating members to move the blades to open position.

9. In a multiple-pole switch, the combination with a plurality of switch units each comprising a pair of contacts, means supporting the said contacts, and means for effecting relative rotation of the contacts of said pair to open and to close the switch unit; the combined weight of the said means of each switch unit opposing closing movement of the switch unit during the initial portion of such movement and aiding the said closing movement during the final portion of such movement; of means for counteracting the tendency of the combined weight of the said means of each switch unit to oppose closing movement thereof, said counteracting means including a bar connected to each of said rotation-effecting means, means eccentrically mounting said bar for rocking movement, and means for rocking said bar to actuate all of said rotation-effecting means.

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