Jan. 30, 1945. C. L. GARRISON 2,368,462

DISCONNECTING SWITCH

Filed Aug. 7, 1943

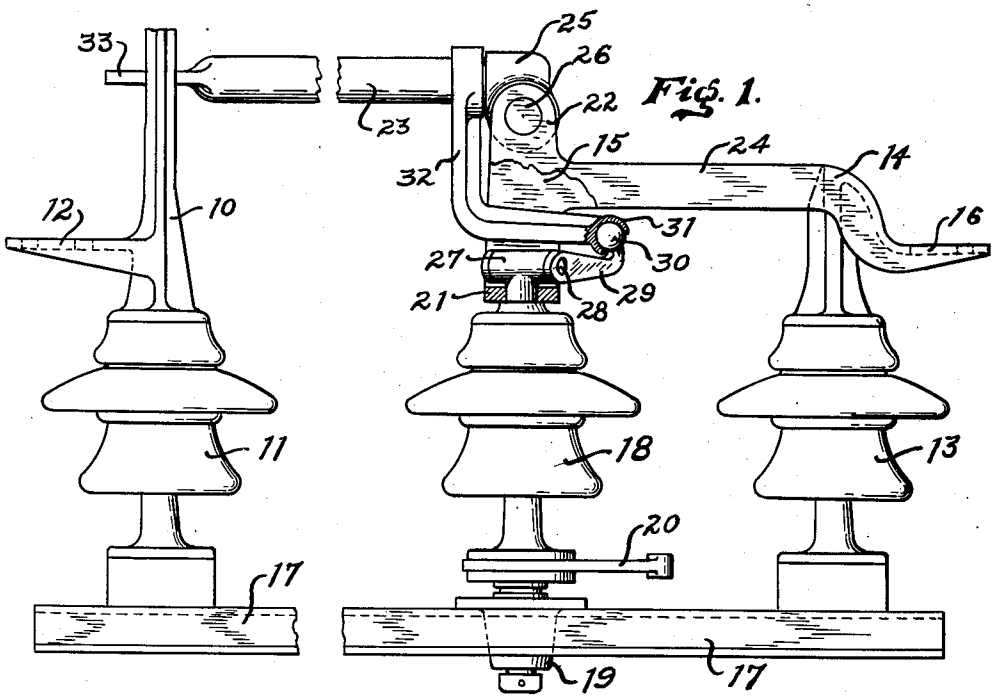


Fig. 1.

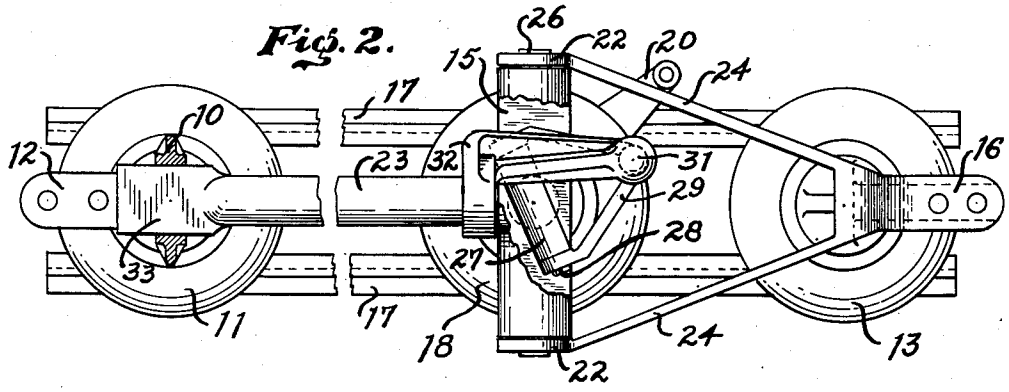


Fig. 2.

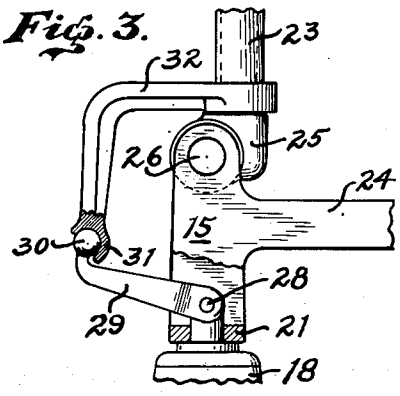


Fig. 3.

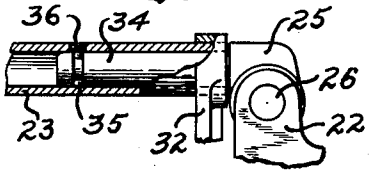


Fig. 4.

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DISCONNECTING SWITCH

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5 Claims. (Cl. 200—48)

My present invention relates to disconnecting switches, and more particularly to disconnecting switches of the type in which the switch blade is adapted to be turned about its longitudinal axis to bring contact surfaces at the end thereof into high pressure contact making engagement with a cooperating stationary contact.

An object of the invention is to provide an operating mechanism for a disconnecting switch of the above type in which the circuit opening and closing movements of the switch blade and the contact pressure establishing rotary movements thereof are produced in a novel, efficient and practical manner.

Another object of the invention is to provide an operating mechanism for a pivotally mounted disconnecting switch blade of the type that is rotatable into and out of contact making engagement with a stationary contact when the switch blade is in its closed circuit position, in which a substantial rotary movement is imparted to the switch blade prior to any pivotal circuit opening movement thereof or subsequent to any pivotal circuit closing movement thereof with respect to its cooperating stationary contact.

Another object of the invention is to provide an improvement in a disconnecting switch of the character described having a pivotally mouned blade that moves into cooperating relation to a stationary contact with a swinging and rotating movement, in which the blade operating forces are transmitted to the switch blade from a rotatable insulator stand positioned immediately below the pivoted end of the switch blade.

In the art to which my present invention relates there are several types of operating mechanisms for disconnecting switches of the character contemplated. In each of these arrangements the operating mechanism, after swinging the switch blade between its open and closed circuit positions, also imparts rotation to the blade for the purpose of bringing contact surfaces at the end thereof into high pressure engagement with a stationary contact of proper design. To accomplish the object resort has generally been had to levers and links and to overcenter travel of the operating insulator column in order to complete the high pressure contact. While this overcenter travel of the insulator column limits, to a degree, the swinging movement of the switch blade during its rotative movement, due to the inherent characteristics of these operating mechanisms, unless there is provided considerable looseness in the connections of the operating mechanism, the switch blade will start its swinging movement at the same time that its rotary movement is initiated. Therefore, special precautions needs be taken to hold the switch blade against any undesirable swinging movement as its operating mechanism imparts the desired turning movement to the switch blade to move it into and out of cooperating high pressure engagement with the stationary contact.

To overcome the above disadvantages, I have provided an operating mechanism in which the blade swinging and rotating forces are transmitted from a rotatable insulator column located immediately below the pivotally supported end of the switch blade and through a lever connection that will impart a maximum of swinging movement to the switch blade and, at the same time, produce a turning of the switch blade sufficient to establish a high contact pressure when the switch blade is in its closed circuit position with respect to the stationary contact with which it cooperates.

Other objects and advantages of my invention will be in part evident to those skilled in the art and in part pointed out hereinafter in the following description taken in connection with the accompanying drawing, wherein there is shown, for purposes of illustration and not of limitation, a preferred embodiment of the invention.

In the accompanying drawing;

Figure 1 is a side elevation showing a disconnecting switch constructed in accordance with a preferred embodiment of the invention,

Figure 2 is a plan view of the disconnecting switch shown in Figure 1 with parts broken away to show certain details of construction,

Figure 3 is a fragmentary view showing the position of the operating mechanism when the switch blade is in its full open circuit position, and

Figure 4 is a fragmentary view, partially in section, showing in detail a simple form of switch blade supporting spindle.

Upon referring to the drawing it will be noted that the switch, constructed in accordance with my present invention, differs in operation and arrangement from most of the other disconnecting switches of this character in that the switch blade is operated in both its turning and swinging movements by an operating mechanism carried by a rotatable insulator that is located immediately below the pivotal axis of the switch blade and between two other aligned and outwardly disposed stationary insulator columns which provide supports for the line terminals of the disconnecting switch. In this arrangement the stationary contact of the disconnecting switch, designated by the numeral 10, is shown as supported upon a stationary insulator column 11, and extending outwardly from this stationary contact there is an integrally formed termi-

nal supporting lug 12 to which one end of the power line conductor can be connected. At the other end of the switch there is a second stationary insulator column 13 that forms a fixed support for the outer end 14 of a yoke-like switch blade supporting member 15. The outer end 14 of the yoke-like supporting member 15 is also shown as having an integrally formed terminal supporting lug 16 to which the other end of a power line conductor can be connected. The stationary insulator columns 11 and 13 are preferably secured upon two spaced and parallel extending members 17 which may be the crossarms of a supporting pole, or they may be structural portions of a suitable transmission line supporting tower or the like. Also mounted upon these structural members 17 and intermediate the stationary insulator columns 11 and 13 there is a third insulator column 18 that is journaled at its lower end in a suitable bearing 19 so that it may be turned through a predetermined angle by means of an operating lever 20 which is here shown as extending outwardly from the lower end of this insulator column. At its upper end the insulator column 18 is journaled in a transversely extending portion 21 of the yoke-like member 15 and from the sides of which the yoke-like member extends upwardly so as to form two spaced trunnions 22 between which a switch blade 23 is pivotally mounted, as will hereinafter appear.

As will be more clearly seen from an inspection of Figure 2 of the drawing, the transversely extending portion 21 of the yoke-like member 15 is disposed in a horizontal plane and the spaced trunnions 22 at the sides thereof are held in a fixed position by means of rearwardly extending strut forming portions 24 that connect with the outer end 14 of the yoke-like member 15. At this point it will also be noted that the switch blade 23 is rotatably mounted upon and extends outwardly from a hub-like support 25 that is journaled upon a horizontally extending shaft 26 which is supported at its ends by the trunnions 22 of the yoke-like member 15. At its upper end and disposed between the spaced trunnions 22 of the yoke-like member 15, the rotatable insulator column 18 carries an operating head 27 that carries a transversely extending pin 28 upon which a lever 29 is pivotally mounted to swing up and down at its outer end as the rotatable insulator column 18 is turned in operating the switch. At its outer end the lever 29 is preferably provided with a spherical or ball-like portion 30 that is engaged by a complementary socket or spherical recess 31 carried by a second lever 32 which is secured upon and extends downwardly from the rotatable switch blade 23. In its preferred form the lever 32 comprises a portion that extends downwardly and radial to the axis about which the switch blade 23 rotates, and also a portion which terminates at the socket 31 that extends rearwardly of the pivotal axis of the switch blade 23 and over the axis of the rotatable insulator column 18. However, it will be seen that this lever 32 need not take this form, as it could well be straight and extend diagonally between its point of attachment to the switch blade and the spherical socket 31 at the end thereof.

Upon referring to Figure 4 of the drawing it will be seen that the rotatable switch blade 23 is, in the main, of tubular construction, its outer end only being flattened so as to provide a beavertail portion 33 having oppositely disposed stationary contact engaging surfaces. While it is conceivable that the rotatable blade 23 may be mounted upon its hub-like support 25 in any suitable manner, the simple expedient illustrated in this latter figure of the drawing will be found practical, inexpensive and effective. As here shown, the rotatable blade 23 is telescoped over an outwardly extending spindle 34 that extends substantially transverse and tangent to the axis of the shaft 26 upon which the hub-like support 25 is mounted. In order to secure the rotatable blade 23 against axial displacement, the spindle 34 is provided with an annular recess 35 that extends around the spindle 34 near its outer end, and engaging this recess 35 the switch blade 23 has one or more set screws 36, the ends of which extend into and move freely within the recess 35 as the rotatable switch blade 23 is turned to establish the desired high contact pressure engagement with the stationary contact 16.

In operation it will be seen that when the rotatable insulator column 18 is turned clockwise, as viewed in Figure 2 of the drawing, by means of its operating lever 20, the pivotally mounted lever arm 29 will be carried around and cause the lever arm 32 to move across the axis of the insulator column 18. This will impart a limited turning movement to the rotatable switch blade 23. In this operation the outer end of the lever arm 32 will move in a downwardly sweeping arc and, at the same time, the spherical end 30 of the lever arm 29 will be carried downwardly through this arc and, as a result, no swinging movement will be imparted to the switch blade 23. Immediately after this swinging movement of the lever arm 32, however, the lever arm 32 will be subjected to a component of forces which will cause it to swing clockwise, as viewed in Figure 1 of the drawing, about the axis of the shaft 26 upon which the switch blade 23 is pivoted. This will cause the switch blade 23 to move upwardly and into its open circuit position, as illustrated in Figure 3 of the drawing. In closing the switch the above operations will occur in the reverse order and after the switch blade 23 has swung downwardly and substantially into its circuit closing position, the lever arm 32 will move over the center of the rotatable insulator column 18 and turn the switch blade 23 through an arc sufficient to reestablish the high contact pressure engagement between the switch blade 23 and the stationary contact 16.

While we have, for the sake of clearness and in order to disclose the invention so that the same can be readily understood, described and illustrated a particular arrangement, I desire to have it understood that this invention is not necessarily limited to the particular arrangement disclosed, but may be embodied in other ways that will suggest themselves to persons skilled in the art. It is believed that this invention is new and it is desired to claim it so that all such changes as come within the scope of the appended claims are to be considered as part of this invention.

Having thus described my invention, what I claim and desire to secure by Letters Patent is:

1. In an operating mechanism for a disconnecting switch of the type in which the switch blade is turned about its longitudinal axis to produce a high contact pressure engagement with a stationary contact, the combination of a rotatable insulator stand adapted to turn about a vertical axis, a fixed yoke-like support at the upper end of said rotatable insulator stand, said

yoke-like support having spaced upwardly extending trunnions at its ends, an operating head fixed to the upper end of said insulator stand and disposed between the upwardly extending trunnions of said yoke-like support, a lever arm pivotally mounted upon said operating head and extending outwardly from the axis of said rotatable insulator stand, a hub-like support journaled between the trunnions of said fixed support, a switch blade journaled upon said hub-like support and adapted to turn about its longitudinal axis, and an L-shaped lever arm secured at its upper end to said switch blade and extending downwardly with respect to said switch blade and rearwardly over said rotatable insulator stand, and a ball and socket connection between the lower end of said L-shaped lever arm and the lever arm carried by said operating head, whereby said switch blade will be turned about its longitudinal axis during a portion of the rotative movement of said insulator stand and subsequently caused to swing in a vertical plane with said hub-like support during another portion of the rotative movement of said insulator stand.

2. In an operating mechanism for a disconnecting switch of the type in which the switch blade is turned about its longitudinal axis to produce a high contact pressure engagement with a stationary contact, the combination of a rotatable insulator column adapted to turn about a vertical axis, a transversely extending yoke-like support at the upper end of said rotatable insulator column, said yoke-like support having spaced trunnions at its ends, an operating head fixed to the upper end of said insulator column and disposed between the trunnions of said yoke-like support, a lever arm extending radially from the axis of said rotatable insulator column and pivoted to swing vertically with respect to said operating head, a hub-like support journaled between the trunnions of said yoke-like support, a switch blade journaled upon said hub-like support to turn about its longitudinal axis, a second lever arm secured at one end to said switch blade and extending downwardly with respect to said switch blade and rearwardly over said rotatable insulator column, and a universal connection between said first and second lever arms, whereby said switch blade will be turned about its longitudinal axis during a portion of the rotative movement of said insulator column and subsequently swung in a vertical plane during another portion of the rotative movement of said insulator column.

3. In a disconnecting switch of the type in which the switch blade is adapted to first swing and subsequently turn about its longitudinal axis to establisn a high contact pressure engagement with a stationary contact, the combination of a stationary contact having spaced oppositely disposed contact surfaces, a pivotally mounted and turnable switch blade having contact surfaces at its end adapted to engage the opposed contact surfaces of said stationary contact, a support having a transversely extending shaft upon which said switch blade is pivotally and turnably mounted, a rotatable insulator stand journaled at its upper end in said support and extending axially at a right angle to said transversely extending shaft, a pivotally secured lever arm extending radially from the axis of said rotatable insulator stand and adapted to swing in a vertical arc when said insulator stand is turned about its axis, and a second lever arm extending from said switch blade and connected at its free end to the pivotally secured lever arm carried by said rotatable insulator stand, said first and second lever arms being connected together at their ends by means permitting a universal movement, whereby said switch blade will be caused to turn about its longitudinal axis during an initial rotative movement of said rotatable insulator stand and subsequently swing upwardly with respect to its support and into an open circuit position.

4. In a disconnecting switch of the type in which the switch blade is adapted to swing and be turned about its longitudinal axis to produce a high contact pressure engagement with a stationary contact, the combination of a stationary contact having spaced oppositely disposed contact surfaces, a turnable and pivotally mounted switch blade having laterally disposed contact surfaces at its end adapted to engage the opposed contact surfaces of said stationary contact, a yoke-like bearing member having a transversely extending shaft upon which said switch blade is mounted for both a turning and swinging movement, a rotatable insulator stand journaled at its upper end to said yoke-like bearing member, a lever arm extending radially from the axis of said rotatable insulator stand, said lever arm being pivotally secured upon said insulator stand and adapted to swing in a vertical path as said rotatable insulator stand is turned about its axis, a second lever arm normally extending downwardly from said switch blade and rearwardly over the axis of said rotatable insulator stand, and a universal connection between the ends of said first and second lever arms, whereby in opening a circuit said switch blade will be caused to turn about its axis during an initial rotative movement of said rotatable insulator stand and subsequently swing upwardly into an open circuit position as the rotation of said insulator stand continues.

5. In a disconnecting switch of the character described having a switch blade adapted to be swung into and out of cooperating relation with a fixed contact and turned into and out of high pressure contact therewith, the combination of a rotatable insulator column adapted to be turned about its axis, a stationary support forming means into which the upper end of said rotatable insulator column is rotatably secured, a switch blade pivotally mounted at one end upon said support forming means and adapted for a limited turning movement about its longitudinal axis, a lever arm carried by the upper end of said insulator column and extending radially from the axis thereof and adapted to swing vertically with respect thereto as the insulator column rotates, and a second lever arm fixed to and extending from said switch blade and having its free end connected to said first lever arm by a universal connection, whereby said lever arms operating conjointly will cause said switch blade to turn about its longitudinal axis during one portion of the rotative movement of said insulator column and also swing in a vertical plane during another portion of the rotative movement of said insulator column.

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