Dec. 15, 1931. H. B. DWIGHT 1,836,708

ELECTRICAL SWITCH

Filed Dec. 19, 1928

Fig. 1

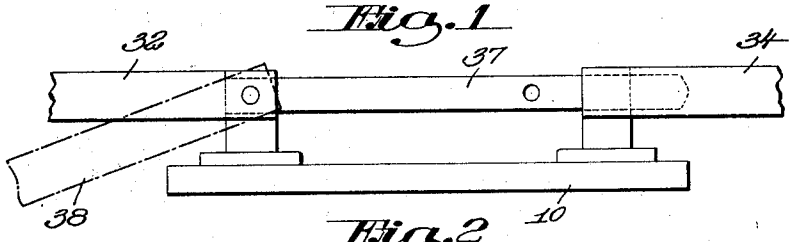
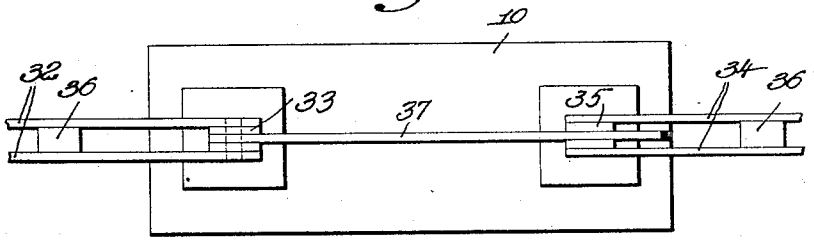


Fig. 2



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ELECTRICAL SWITCH

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The present invention relates to electrical switches and more particularly to high voltage isolating switches commonly known as disconnecting switches.

Disconnecting switches are ordinarily employed for the purpose of occasionally isolating the line from the power equipment and are not intended to break a circuit carrying a heavy load. Because of the fact that they are not frequently operated, they may be of quite simple construction, comprising merely a pivoted blade cooperating with a hinge and a jaw, the whole switch being unenclosed and for reasons of safety, being usually placed at a considerable height above the floor. The ordinary type of disconnecting switch possesses the disadvantage that it is subject to forces which tend to blow it open. These forces arise from the interaction of the current in the blade with magnetic fields set up by the currents in the hinge and jaw and in the associated conductors. These opening forces are normally resisted by the frictional engagement of the blade with the hinge and jaw, which is sufficient under normal conditions to hold the switch closed but under abnormal circumstances, such as a high overload or a short circuit, the forces rise to such values as to overcome the frictional resistance. Inasmuch as these switches are not intended to act as overload circuit breakers, such accidental opening is highly undesirable, both from the standpoint of the difficulty of again closing the switch in its relatively inaccessible position, and also of the injury likely to be caused to the switch by the intense arc formed by the breaking of a circuit carrying a high current. It has been proposed to prevent accidental opening of the switch under abnormal currents by the provision of mechanical devices for locking the blade but these have the disadvantage of complicating the construction of an otherwise simple piece of equipment and consequently increasing the expense and the necessity for repairs.

The object of the present invention is to provide a simple and inexpensive disconnecting switch in which there is no inherent tendency to open the blade, whereby the switch remains closed even under excessive loads.

With this object in view, one feature of the present invention comprises a switch and an associated circuit therefor in which the magnetic fields set up by the currents external to the blade are so disposed both in position and direction relative to the blade that no forces sufficient to open the blade are applied thereto. From calculations and experiment on ordinary forms of disconnecting switches, I have discovered that the principal force tending to open the blade is caused by the currents in the hinge and jaw, which currents are at right angles to the current of the blade and which therefore set up magnetic fields cutting the current carrying blade in such a direction as to apply opening forces thereto. The magnitudes of such forces depend upon the strength of the current and also on the length of the right angle portion through which the current passes to the blade. The conductors which connect with the hinge and jaw at the base of the switch and which lie parallel to the switch blade, also set up fields which have some effect on the blade but the forces thus set up in the usual circuits are not ordinarily of great importance compared to the forces arising from the right angle currents in the hinge and jaw.

According to the present invention, the switch comprises a blade, blade engaging members including a hinge and jaw, together with conductors forming a circuit external to the blade and connected to the blade engaging members at approximately the same surface of contact as the blade itself, whereby the current enters directly from the external circuit into the blade without traversing the right angle portions of the hinge or jaw. In the preferred form of the invention, the blade and the conductors of the external circuit have substantially coincident axes, so that no forces in any direction are applied to the blade.

In the accompanying drawings, Fig. 1 is a side elevation of a switch in which no substantial forces in either an opening or a closing direction are set up; and Fig. 2 is a plan view of the switch shown in Fig. 1.

In the illustrated construction, a pair of conductors 32 lead to the hinge 33 and are suitably connected thereto and a similar pair of conductors 34 are attached to the jaw 35. The conductors are held apart by spacers 36 placed at a distance from the hinge and jaw in order to permit springing of the blades of the hinge and jaw in opening or closing the switch. The separate conductors of each pair may be connected together beyond the spacers 36, if desired. The blade 37 is pivoted at one end to the hinge, and is adapted to engage the jaw 35 at the other end. The hinge and jaw are mounted on a suitable base 10.

The conductors are therefore connected to the blade engaging members over surfaces practically co-extensive with the surfaces of engagement of the blade therewith, that is to say, the blade and the conductors of the circuit external to the blade are so arranged that the current enters directly into the blade without traversing any right angle portions of the hinge and jaw. As shown in full lines in Fig. 1, the conductors and the blade are disposed in the same line, that is, they have coincident axes when the switch is closed. From the symmetry of the construction, it is evident that no unbalanced force can act on the blade, either in opening or closing direction. Describing the construction in another way, the angle between the center line of the blade and the center line of the conductor is 180° as measured from the blade to the conductor in the direction of the closing movement of the switch, when the switch is closed.

A modified form of the construction is indicated in dot-and-dash lines shown in the conductor 38 disposed from the blade at an angle slightly less than 180°. This constructure, although not completely eliminating all forces, brings about an opening force of such small magnitude as to be practically negligible. The construction may be preferred for mechanical reasons to that shown in full lines. In any case, the conductor is connected directly with the blade engaging surface of the hinge or jaw so that the right angle currents which would set up opening forces are entirely eliminated.

It will be understood that although the invention has been described as embodied in a switch having its hinge and jaw mounted on a base 10, this mounting is to be considered as diagrammatic only, and where insulation against high voltage is necessary, the mounting of the hinge and jaw on separate insulators may be preferred. Also it will be understood that the blade is not limited to the single strap but may comprise a plurality of parallel connected straps according to any usual or preferred construction.

Having thus described the invention, what is claimed is:

1. A disconnecting switch comprising a single blade, blade engaging members including a hinge to which the blade is pivoted and a jaw, conductors connected with the blade engaging members and having substantially coincident axes with the blade to permit the existence of no forces to open the blade under heavy currents.

2. A disconnecting switch comprising a single blade, blade engaging members including a hinge to which the blade is pivoted and a jaw, conductors connected with the blade engaging members over surfaces substantially co-extensive with the surfaces of engagement of the blade therewith and having substantially coincident axes with the blade when the switch is closed to permit the existence of no forces to open the blade under heavy currents.

In testimony whereof I have signed my name to this specification.

HERBERT BRISTOL DWIGHT.