Sept. 16, 1930. T. T. GREENWOOD 1,775,854

ELECTRIC SWITCH AND CONTACT STRUCTURE THEREFOR

Filed June 29, 1929

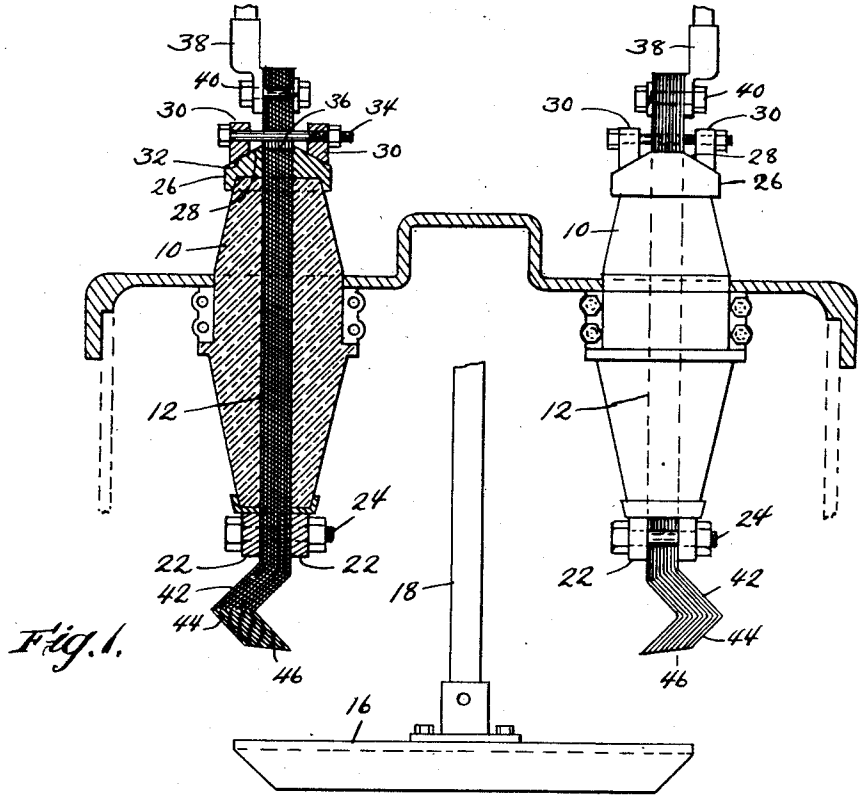


Fig. 1.

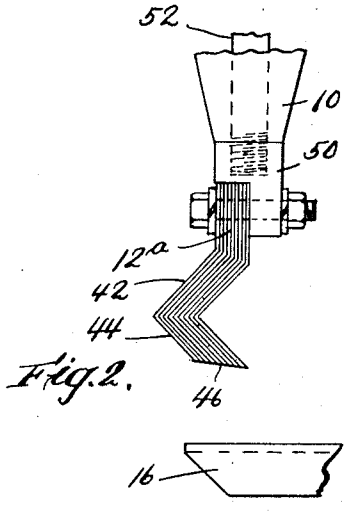


Fig. 2.

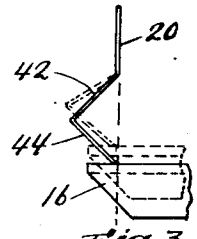


Fig. 3.

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UNITED STATES PATENT OFFICE

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ELECTRIC SWITCH AND CONTACT STRUCTURE THEREFOR

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This invention relates to electric switches and particularly to the contact structures therefor. An electric switch usually is provided with a laminated contact structure or brush which cooperates with a solid unlaminated contact member to control the main current path through the switch. The brush member may constitute either the fixed or the movable contact member of the switch. The brush member usually has a contact portion thereof which is inclined to the line of switch closing and opening movement so that each lamination can independently engage the cooperating contact member and also so that the contact end of each lamination can slide a little on the contact face of the cooperating contact member during circuit closing movements thereby to keep the contact faces clean.

One type of brush member has been proposed wherein the shank is arranged in the line of switch closing and opening movement or, in the case of a down break switch, is vertical, and the toe portion of the brush is bent at an angle with respect to the shank. This type of brush is liable to "stub its toe" on the cooperating contact member. That is, if the brush and the cooperating contact member have been moved into initial engagement and further movement in a switch closing direction is effected to secure good contact pressure, the brush laminations can not take care of this further movement except by sliding on the contact face of the cooperating contact member. The brush must be made stiff and the angle of inclination must be steep in order to get good contact pressure. Consequently, the ends of the brush dig into the cooperating contact member and score it so that the initially good contact is destroyed and the switch cannot carry the current for which it is designed without heating and burning.

It is an object of the present invention to provide a brush member for an electric switch wherein the shank of the brush is in line with the switch closing movement and the toe portion of the brush is at an angle to the switch closing movement and means are provided which are interposed between the toe portion and the shank of the brush to permit the laminations in the toe portion to yield in the line of switch closing movement without causing the contact ends of the laminations to slide over and dig into the cooperating contact member to such a degree as will affect the current carrying ability of the switch.

A further object of the invention is generally to improve electric switches and contact members therefor.

Fig. 1 is an elevation, partly in section, and illustrating those elements of the switch which are necessary for an understanding of the present invention.

Fig. 2 is an illustration of a modified form of the present invention.

Fig. 3 represents diagrammatically the manner in which one of the laminations of the brush member can yield in the line of switch closing movement without sliding over its cooperating contact member.

As shown in Fig. 1, the switch has the stationary switch members which include the insulating bushings 10 of rectangular cross-section with the rectangular conducting studs 12 therein and the laminated brush members 14 at the lower end of the studs. The brush members are bridged by the movable switch, or bridging, member 16 carried by an insulated lifting rod 18. The switch here shown is of the down-break type wherein the lifting rod is moved in a vertical direction to close and open the circuit through the switch. The studs 12 are vertical or are arranged parallel to or in the line of the switch closing and opening movements as shown in Fig. 1. The construction of both stationary switch members is or can be identical and but one need be described. The stud 12 and the brush member 14 are integral and one is a continuation of the other. Both the stud and the brush member are composed of a plurality of laminations 20 which are arranged in superimposed order and secured together. The laminations are continuous throughout the stud and the brush member. The stud thus constitutes a vertical attaching shank for the brush member. The stud is clamped remov-

ably within a passage of rectangular cross-section in the insulator 10. Plates 22 are secured on opposite sides of the stud 12 by a bolt 24, and bear against the lower end of the insulating bushing. The upper end of the bushing is provided with a metal cap 26 which has two parallel inclined faces 28 disposed on opposite sides of the upper end of the stud. Plates 30 are disposed on opposite sides of the stud and have correspondingly inclined lower faces 32 which bear against the tapered faces 28. Said plates 30 are drawn toward each other by a bolt 34 which is passed therethrough and through a transverse passage 36 in the stud. The bolt bears against the upper portion of the wall of said passage and thus draws the stud upwardly and the lower plate 32 into firm engagement with the lower end of the insulating bushing. A connecting terminal 38 is secured by a bolt 40 to the upper end of the stud.

In accordance with this invention, the brush member, or the lower portion of the stud, is provided with a downwardly and outwardly inclined section 42 which constitutes the intermediate resilient means comprising a part of the present invention. The brush is also provided with a toe portion 44 which is inclined inwardly and downwardly from the section 42 and the inclination is reversed with respect to the inclination of said intermediate section 42. The laminations 20 are continuous between the sections 44, 42 and the stud or vertical shank 12. The lower ends of the laminations in the toe portion terminate in a contact face 46 which is engaged by the bridging member 16.

Heretofore brushes of this type have invariably been constructed without the resilient intermediate section 42 and thus the laminations in the toe portion have been caused to slide over and dig into the bridging member 16 since the laminations were not free to move in any other manner during the final closing movement of the switch. By the provision of the intermediate resilient section 42, however, the laminations in the toe portion 44 of the brush are free to move vertically or in the line of switch closing movement and thus will not slide in any detrimental manner on or dig into the face of the bridging member. This action is shown in Fig. 3. The heavy line indicates one of the laminations 20 of the brush member at the point where it is engaged by the movable bridging member. When the bridging member moves upwardly into its final switch closing position as shown by the dotted lines, the laminations in the toe portion of the brush are moved vertically upward without sliding in any detrimental manner over the bridging member, the laminations in the intermediate section 42 of the brush flexing into some position, as shown by the dotted lines, to permit this vertical displacement of the lamination in the toe portion of the brush. Thus the invention provides a brush member of the type having a shank which is parallel to the direction of switch closing movement and an inclined toe portion with markedly improved operating characteristics.

With this construction, the brush also is urged more forcibly into engagement with the bridging member than heretofore for not only does the general magnetic reaction in the U-shaped current loop through the switch act upon the toe portion of the brush in a direction to enhance the contact pressure but the reaction between the angularly related toe and intermediate sections 44 and 42 and between the angularly related intermediate and shank sections 44 and 12 also tends to increase the contact pressure.

The modified form of brush member shown in Fig. 2 is essentially the same as that shown in Fig. 1 except that the vertical shank 12^a is not extended in a continuous manner through the insulator 10 but is secured to a block 50 which in turn is connected with the lower end of the solid cylindrical stud 52.

The operation of the brush member illustrated in Fig. 2 is identical with that above described.

A further advantage of this arrangement is that the contact face of the brush is substantially under and is in line with the vertical shank and the insulator so that there are no undue eccentric forces acting on the insulator tending to bend and unduly stress it. The same arrangement also reduces the clearance space that is necessary between the pair of bushings and also the clearance space between the bushings and the walls of the enclosing oil tank, not shown, since the brush member does not protrude unduly in any direction beyond the lower end of the bushing.

I claim:

1. A laminated brush member for an electric switch, said brush member having a shank which is parallel to the line of switch closing movement, a laminated toe portion which is inclined with respect to said shank and has the end of its laminations terminated in a contact face, and resilient means connecting said inclined toe portion and said shank permitting the laminations in said toe portion to move in the line of switch closing movement substantially free from a deleterious movement transverse to said line of switch closing movement.

2. An electric switch having separable contact members one of which constitutes a laminated brush member having a supporting shank that is parallel to the line of switch closing movement, a toe portion which is inclined with respect to said shank and is terminated in a contact face that engages said other contact member, and resilient means

connecting and interposed between said inclined toe portion and said shank which constrains the laminations of said toe portion to yield in the line of switch closing movement without deleterious transverse movement with respect to said line of switch movement and in contact with said other contact member.

3. An electric switch having separable contact members one of which constitutes a brush member, said brush member having a shank which is parallel to the line of switch closing movement, an intermediate section which is inclined in one direction with respect to said shank, and a toe portion which is inclined in the opposite direction with respect to said intermediate portion, the laminations of the brush member being continuous throughout said shank and said intermediate and toe portions and being terminated in the free end of said toe portion in a contact face which engages said other contact member, said intermediate inclined portion constituting means to permit the laminations of said toe portion to yield in the line of switch closing movement while in engagement with said other contact member and without deleterious movement transversely of said line of switch closing movement on said other contact member.

4. An electric switch having separable contact members one of which constitutes a brush member, said brush member having a shank which is parallel to the line of switch closing movement, an intermediate section which is inclined in one direction with respect to said shank, and a toe portion which is inclined in the opposite direction with respect to said intermediate portion, the laminations of the brush member being continuous throughout said shank and said intermediate and toe portions and being terminated in the free end of said toe portion in a contact face which engages said other contact member, said intermediate inclined portion constituting means to permit the laminations of said toe portion to yield in the line of switch closing movement while in engagement with said other contact member and without deleterious movement transversely of said line of switch closing movement on said other contact member, said intermediate section also constituting means to react magnetically on said toe portion and increase its contact pressure on said other contact member.

5. An electric switch including an insulating bushing, a stud located in said bushing consisting of a plurality of resilient laminations which extend through the bushing in opposite directions and are terminated at one end of the bushing in a switch terminal, the extended laminations at the other end of the bushing being reflexed in one direction at an angle with respect to the laminations in the stud whereby to provide an intermediate resilient section and below said intermediate section being reflexed in the opposite direction to constitute the contact toe of a brush member, and a movable switch member engageable with the free end of said toe, said intermediate reflexed section constituting means to permit the laminations of said toe portion to move in the line of switch closing movement when engaged by said movable switch member and to prevent said laminations from moving in a deleterious manner on said movable switch member in a direction transverse to the line of switch closing movement.

6. An electric switch having an insulating bushing, a movable switch member, and a cooperating stationary switch member constituting a brush member and including a vertical shank which is extended through said bushing, means to secure said shank in said bushing, said brush member being composed of a plurality of laminations and said shank being composed of the same laminations, the brush member at one end of said bushing having its laminations reflexed in one direction and said reflexed laminations constituting a resilient yielding intermediate section and said laminations below said intermediate section being reflexed in the opposite direction and constituting a toe portion, the free end of which has a contact face, and a movable switch member engageable with said contact face, the laminations of said brush member being continuous in said toe portion and in said intermediate section and shank, and said intermediate section constituting means to permit the laminations in said toe portion to move in the line of switch closing movement and to prevent said laminations from deleterious movement transversely of said line of switch closing movement when engaged by said movable switch member.

7. An electric switch including an insulating bushing, a stud passed through said bushing having a contact member at its lower end, a movable switch member cooperating with said contact member, and means to secure said stud in said bushing including abutments carried by the lower end of said stud and overlying and engaging the lower end of said bushing, the upper end of said bushing having parallel inclined faces disposed on opposite sides of said stud, plates having correspondingly inclined faces received upon the aforesaid tapered faces, and a bolt passed through said plates and said stud and engaging said stud having means to draw said plates toward each other and thus to exert a pressure lengthwise of said stud.

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

TALMA T. GREENWOOD.