Nov. 24, 1931. O. S. EVERETT 1,832,897

ELECTRIC SWITCH AND CONTACT STRUCTURE THEREFOR

Filed Oct. 28, 1927

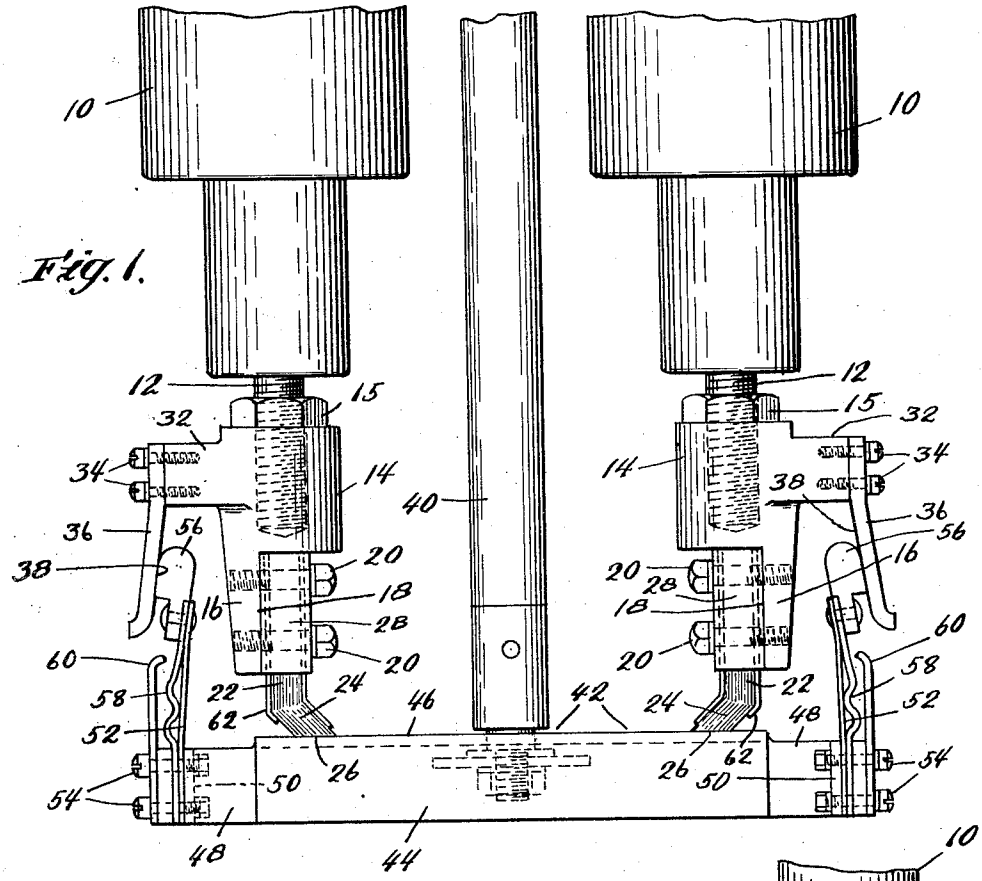


Fig. 1.

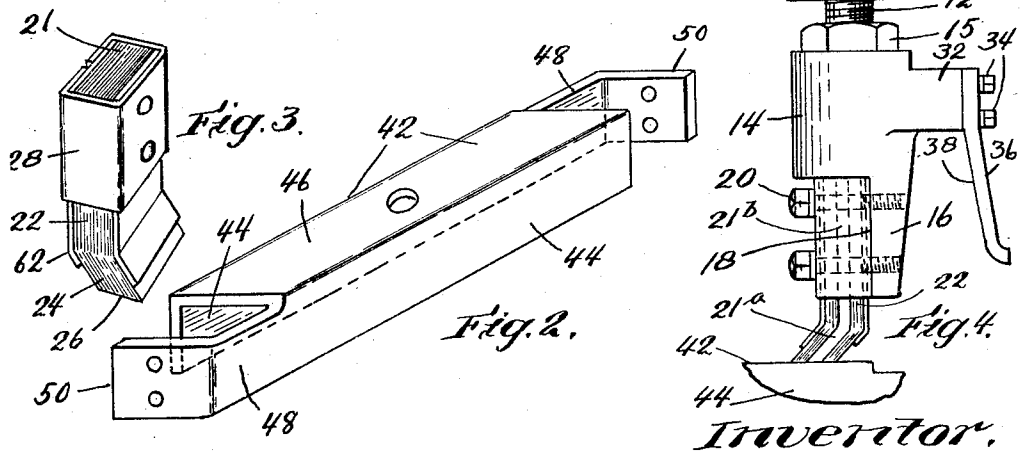


Fig. 4.

Fig. 3.

Fig. 2.

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by [illegible] Atty

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UNITED STATES PATENT OFFICE

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ELECTRIC SWITCH AND CONTACT STRUCTURE THEREFOR

Application filed October 28, 1927. Serial No. 229,511.

This invention relates to electric switches of relatively high current carrying capacity, and has for one of its objects the provision of an improved contact structure in which the magnetic effect of the current traversing the switch has a tendency to urge the contacts into closer engagement and in which certain economies are made possible by the construction and arrangement of the contact members.

It is well known that the usual U-shaped laminated brush member cannot be employed satisfactorily in switches which are traversed by heavy currents due to the magnetic effect of the current which tends to force the resilient brush away from its cooperating contact members. So called non-reactive, or inverted, brush members are known in which this difficulty is minimized and in which the inherent advantages of the laminated brush construction are maintained but, prior to my invention, the use of the inverted brush has been limited because of the fact that increased spacing of the stationary switch members was necessary to provide safe spacing between the brush contact members. This increased the size of the switches and in the case of oil immersed switches necessitated very much larger oil tanks.

It is therefore an object of this invention to provide a novel brush construction and disposition for an electric switch which will permit minimum spacing of the stationary switch members.

Inverted brushes, prior to my invention, were so arranged in relation to the stationary switch member that the impact of the closing movement of the switch was applied eccentrically to the stationary switch members. Due to the frangible nature of the porcelain insulators supporting the switch members, massive insulating bushings were required to prevent breakage.

It is an object of this invention to provide a brush construction for electric switches wherein the impact of the movable switch member on the stationary switch members will be applied substantially concentrically therewith.

Another object is to provide a brush construction and arrangement by which the brush can be cooled and thus adapted to carry heavy currents.

A still further object is generally to improve the construction of electric switches and the current conducting component thereof.

Fig. 1 is a side elevation of the contact structure of an electric switch embodying the invention.

Fig. 2 is a perspective view of the contact bridging member showing the method of supporting the auxiliary contact members.

Fig. 3 is a perspective detail of the brush member.

Fig. 4 is a detail of a modified form of brush, having provision for the cooling of the interior thereof.

As here shown, the invention is incorporated in an electric switch of the down break type having stationary switch members including the insulating bushings 10 and the conducting studs 12 enclosed and supported thereby. Terminal blocks 14 are secured in good electrical contact with said studs at their lower ends by being screw-threaded thereon and are fixed against rotation on said studs by lock nuts 15. Said terminal blocks 14 support the stationary main contact members and to this end are formed with integral downwardly directed legs 16 having the opposed flat vertical clamping faces 18 against which said main contacts are removably secured by bolts 20; and said faces are located outside the axes of the studs.

Said stationary main contact members, one of which is shown detached in Fig. 3, each comprise a plurality of leaves, or laminations 21 of resilient conducting material, as copper, having long vertically-disposed sup-

porting portions or shanks and reflexed downwardly and inwardly directed toe portions 24 which collectively terminate in a substantially horizontal contact face 26. A stiff clamping strap 28 is reflexed about and firmly in mechanical and electrical contact with the superimposed vertical portions 22 of the leaves and is secured against a vertical face 18 of a block by the aforesaid bolts 20.

Said brush members are so arranged in relation to the studs 12 of the stationary switch members that the vertical portions or shanks 22 thereof are disposed substantially parallel and in line with the axes of the studs, so that the angularly-extended toe sections 24 of the brushes are close to the axes of the studs.

Outstanding brackets 32 are also provided integral with said contact blocks 14 at the ends of which the stationary auxiliary contact members are removably secured by means of bolts 34. Said contact members, as here shown, comprise downwardly directed rigid metal straps 36 which are slightly reflexed outwardly from the vertical to provide inclined contact faces 38, thus to insure a wiping engagement of the cooperating vertically movable contact members therewith.

The movable switch member includes a reciprocable insulating operating rod 40 to the lower end of which is secured the conducting contact bridging member 42. As shown more clearly in Fig. 2, said bridging member is of inverted channel section and comprises the depending parallel sides 44 and the integral back 46 to which the switch operating rod 40 is secured in any suitable manner. The back 46 of said channel is adapted to engage the lower horizontal contact faces 26 of said brushes when moved upwardly to switch closing position and complete the circuit through the switch in the usual manner.

A portion of the back and one side of said bridging member is cut away at each end thereof leaving a portion 48 of one side wall at each end extended beyond the main contact portion of said bridging member, and said extended side portions are bent at right angles as shown clearly in Fig. 2 to provide the perpendicular ends 50 which are suitably spaced from the contact portion of said back 46 of said bridging member. Movable auxiliary contact members are carried by said bridging member 42 at the opposite ends thereof and comprise resilient contact supporting strips of metal 52 which are removably secured to the inner surfaces of the reflexed ends 50 of said bridging member by bolts 54 and contact, or arcing, tips 56 are secured, as riveted, to the upstanding ends of the strips 52 in position to engage the inclined contact faces 38 of the stationary arcing contact members. A strip of conducting braid 58 may be provided to shunt each of the resilient strips 52 and prevent sufficient current flowing through strips 52 to heat and impair the resilience thereof, and rigid upstanding stop members 60 secured to the outer faces of the ends 50 provide abutments to limit the outward movement of the contact carrying strip 52 when out of engagement with their cooperating stationary contact members.

With the arrangement herein disclosed, the current traversing the U-shaped path through the conducting components of the switch sets up magnetic forces tending to force the flexible brush members, and especially the toe portions 24 thereof, in a downward and outward direction against the back 46 of said movable bridging member 42 and into firm contact therewith, instead of away therefrom, as with the usual construction, whereby heating and burning of the cooperating contact faces is prevented. A stiff supporting plate 62 may be disposed behind each of the inverted brush members, if desired, and may extend downwardly onto the back of the toe sections 24, whereby the laminations of the brush are supported against the magnetic effects of the current without in any degree impairing the resilience of the brush.

By arranging the brushes in accordance with my invention the minimum spacing between the stationary switch members is preserved, the limiting feature being the requisite spacing between the contact blocks 14 rather than between the inwardly directed toes of the inverted brush, as has usually been the case prior to this invention. In enclosed switches, the savings are considerable both in material and in economy of space, especially in the case of oil immersed switches, since even a small increase in the size of the oil tank means a greatly increased tank cost, because the tanks must be built to withstand the high internal pressures encountered in this type of switch.

The arrangement of the brush members substantially in axial alignment with the insulating bushings is an improvement over the usual inverted brush construction in which the impact of the movable switch member on the stationary switch member, is exerted with relatively great eccentricity to the axes of the studs.

The generally vertical arrangement of the brush permits increased cooling and thus increased current carrying capacity, in the manner illustrated in Fig. 4. In this view the brush is provided with a middle passage 21*a* in both the toe and the body 22 thereof, coextensive with the opposite edge faces of the laminations 21 and formed by omitting a few of the middle laminations and substituting therefor, in the body 22, a spacer member 21*b*. Said passage is open

at the sides for access to the oil in which the switch is immersed and, being vertical, permits a free upward movement of oil from the toe to the body or shank of the brush and thence outwardly thereof, by thermal action, thus abstracting heat from the contact junction and inner laminations of the brush and keeping it cool.

Brushes may have been proposed, heretofore, with horizontally spaced sections, between which oil could not circulate by thermal action due to heat of the brush, or in such manner that the inclination of the passage between the sections was toward the hottest part of the brush, and not away therefrom, thus also preventing thermal circulation of the heated oil. With the present arrangement, however, the contact junction is at the bottom of the passage, and the heated oil is free to ascend between the brush sections and escape laterally into the body of oil in the tank enclosing the switch members.

The construction may be modified in many ways without departing from the scope of the invention.

I claim:

1. A contact structure for an electric switch comprising an axial conducting stud, a terminal block secured to the end of said stud, and a brush-member carried dependently by said terminal block in axial alignment with said stud and terminated at its lower end in a contact face which is normal to said stud and a cooperating contact member arranged to engage said contact face and apply pressure thereon mainly in the direction of the axis of said stud.

2. A contact structure for an electric switch comprising an axial conducting stud, a terminal block secured to said stud, and a brush member having a plurality of laminations which have a vertical section disposed in axial alignment with said stud, the lower end of said brush member being inclined laterally downward below said vertical section and terminated in a contact face.

3. In an electric switch, the combination of an insulating bushing, an axial stud disposed within said bushing, a terminal block carried by said axial stud, at its lower end, a contact member carried by said terminal block comprising a plurality of superposed laminations each having upper and lower angularly related sections, the upper section being secured to said block in axial alignment with said stud and said other section being extended downwardly below and at an angle to said upper section and providing a resilient contact engaging portion terminated in a contact face which is normal to said upper section.

4. A stationary switch member for an electric switch including an insulating bushing, an axial conducting stud having a terminal block at its lower end, and a brush member carried by said terminal block having two angularly related arms one of which arms is secured rigidly to said terminal block in axial alignment with said stud, said other arm arranged to extend downwardly and outwardly from said terminal block.

5. A stationary switch member for an electric switch including an insulating bushing having an axial passage therethrough, a conducting stud extended through said passage, a terminal block secured to the lower end of said stud having a vertical off-set leg depending therebelow, a brush member secured to said leg and disposed substantially in axial alignment with said stud comprising a plurality of laminations each having a vertical attaching portion and an inwardly and downwardly directed toe portion.

6. A stationary switch member for an electric switch including an insulating bushing having an axial passage therethrough, a conducting stud extended through said passage, a terminal block secured to the lower end of said stud having a vertical off-set leg depending therebelow, an inverted brush member secured to said leg comprising a plurality of laminations each having a vertical attaching portion and an inwardly and downwardly directed toe portion, said brush member being disposed directly beneath said terminal block and substantially in alignment with said stud.

7. In an electric switch the combination of a pair of spaced stationary switch members terminated in contact supporting blocks, brush members secured to said blocks having vertical attaching portions which are received in vertical recesses in said blocks, said brush members having downwardly and inwardly directed toe portions arranged to lie wholly beneath said vertical attaching portions and said contact supporting blocks and terminated in substantially horizontal contact faces, and a contact bridging member movable into and out of abutting engagement with the horizontal contact faces of said brush-member.

8. In an electric switch the combination of a pair of depending stationary switch members, insulated brush members carried by said switch members having upper attaching sections secured to said switch members in the line thereof and having toe-sections inclined downwardly and inwardly toward each other and terminated in horizontal contact faces at the under sides thereof, and a movable bridging member cooperating with said toe-sections.

9. A contact structure for an electric switch comprising a contact block having a passage in the upper end thereof to receive a switch stud and a projection extended below the lower end thereof parallel with and offset from the axis of said passage, and a

brush member having a vertical attaching portion in axial alignment with said passage and disposed under the lower end of said block upon and secured to said projection and having a downwardly and laterally-inclined toe-section which is extended below said projection and said vertical attaching portion.

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

OLIVER S. EVERETT.