

Aug. 8, 1939.

P. M. CHRISTENSEN

2,168,747

ELECTRIC SWITCH

Filed July 6, 1938

2 Sheets-Sheet 1

Fig. 1

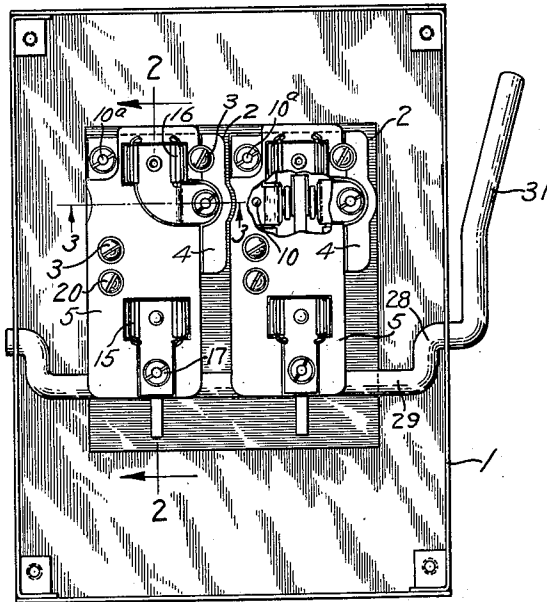


Fig. 2

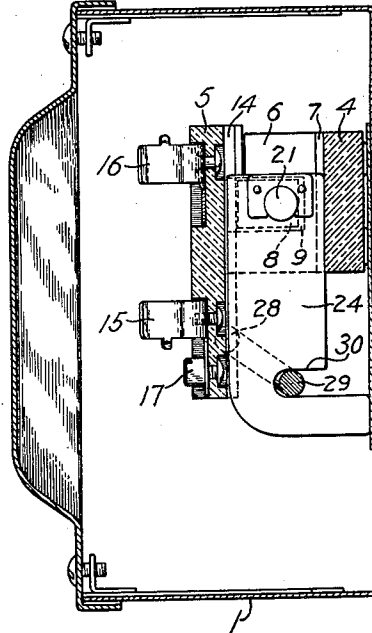


Fig. 3

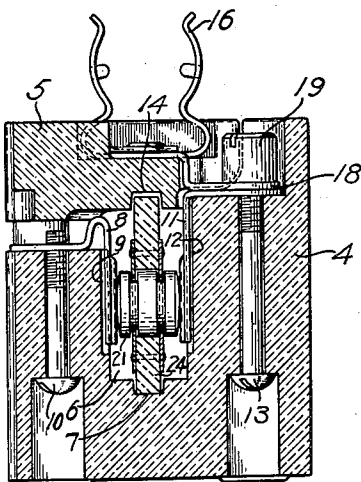


Fig. 4

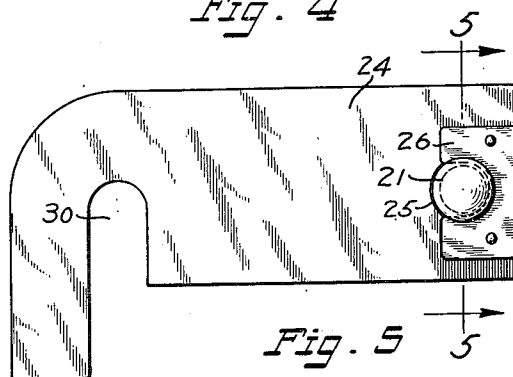
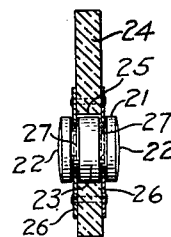


Fig. 5



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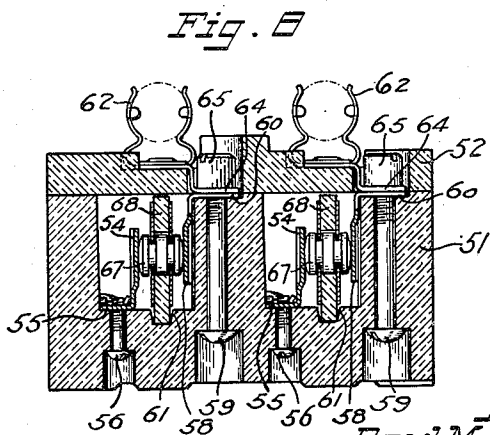
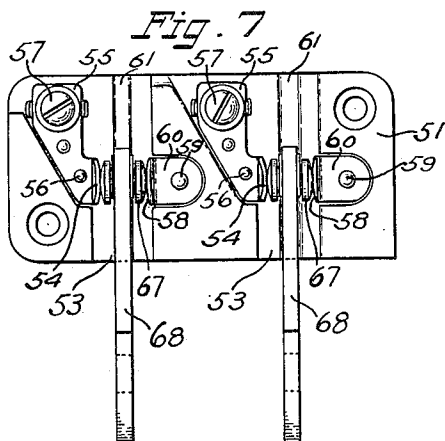
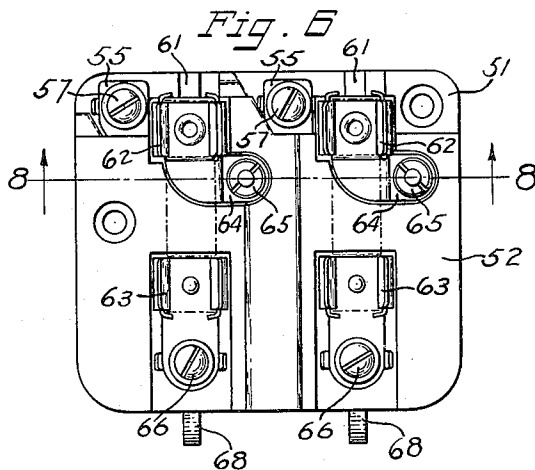
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2 Sheets-Sheet 2



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UNITED STATES PATENT OFFICE

2,168,747

ELECTRIC SWITCH

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Connecticut

Application July 6, 1938, Serial No. 217,792

4 Claims. (Cl. 200—163)

The invention relates to electrical switches of the type wherein opposed contacts are adapted to be connected by a bridging contact supported by a movable contact carrying member.

5 The main object of the invention is to provide a switch in which the opposed contacts and bridging contact are constructed and mounted so that any burning of the contacts due to arcing is confined to those portions of the contacts which are not normally in contact, and so that the bridging contact rotates to some extent each time it is withdrawn from between the opposed contacts to thereby eliminate the concentration of the burning at one location.

15 From the following specification other objects and advantages will be apparent to those skilled in the art.

In the accompanying drawings I have shown the embodiments which I now deem preferable, but it will be understood that the drawings are intended for illustrative purposes only and are not to be relied upon as limiting or defining the scope of the invention, the claims forming a part of this specification being relied upon for that purpose.

In the drawings:

Fig. 1 is an elevational view of a switch embodying the invention, the cover for the casing being omitted.

30 Fig. 2 is a sectional view taken on the line 2—2 of Fig. 1.

Fig. 3 is an enlarged sectional view taken on the line 3—3 of Fig. 1.

35 Fig. 4 is an enlarged elevational view of the contact carrier and contact.

Fig. 5 is a sectional view taken on the line 5—5 of Fig. 4.

40 Fig. 6 is an elevational view of an alternative switch unit embodying the principles of the invention.

Fig. 7 is a view similar to that of Fig. 6 with a portion of the unit removed.

Fig. 8 is a sectional view taken on the line 8—8 of Fig. 6.

45 In the drawings I have illustrated the application of the principles of the invention to fused type switches having reciprocable contact carrying members, but the invention is obviously not limited to switches of this type.

50 Referring to Figs. 1—5, a casing 1 is provided in which is mounted one or more switch units 2 which may or may not be of similar construction. I have shown two identical switch units and it will, therefore, suffice to describe but one. Each switch unit comprises a base of insulating mate-

rial which is preferably mounted in the casing by means of screws 3. For facilitating manufacture, the base is made in two parts 4 and 5.

The part 4 is longitudinally slotted at 6, the bottom of the slot being grooved as indicated at 7. A contact 8 is located adjacent a recess 9 in one side wall of the slot 6 and is secured to the part 4 by a screw 10 extending upward through the part 4. A screw 10^a serves as a binding post for connecting the contact 8 in a circuit. A second contact 11 located in opposed relation to the contact 8 and adjacent a recess 12 in the opposite side wall of the slot 6 is secured in place by a screw 13 extending upward through the base. The contacts 8 and 11 may be made of spring bronze and are preferably formed so that the depending portions located adjacent the recesses 9 and 12 have a limited resilient movement toward and away from each other, the recesses 9 and 12 allowing for the latter movement. The vertical edges of the contacts are made somewhat divergent for reasons which will become apparent hereinafter.

The part 5 of the base is secured to the part 4 and its underside is formed with a groove 14 therein which is vertically aligned with the groove 7. Fuse receiving means, such as the clips 15 and 16, are preferably secured to the top of part 5 in any desired manner. The clip 15 is provided with a binding post 17, while the clip 16 is provided with an offset portion 18 overlying and in electrical contact with a portion of the contact 11. A nut 19 threaded on screw 13 serves to hold the offset portion 18 in firm electrical contact with the contact 11 and also aids in securing part 5 of the base to part 4. A screw 20 extending through part 5 and threaded into a bushing embedded in part 4 is provided for further securing the parts together.

A movable bridging contact 21 is provided for making and breaking the circuit through the contacts 8 and 11. In accordance with the invention the contact surfaces of the bridging contact are convex as indicated at 22, and the contact is so mounted that it is rotatable only about an axis passing through its convex contact surfaces. The contact 21 is preferably, though not necessarily, a solid piece of conducting metal, such as brass, having a cylindrical portion 23. Contact 21 is carried by an insulating member 24 which is movable between contacts 8 and 11, the member being slidable in the grooves 7 and 14 in the base. Member 24 has a circular aperture 25 formed therein which is sufficiently larger in diameter than the cylindrical portion 23 of the

bridging contact to permit the free rotation of the latter when it is mounted in said aperture. Any desired construction may be used to prevent the separation of member 24 and the bridging contact. The now preferred construction for this purpose comprises means, such as plates 26, secured to the member 24 and interlocked with the contact 21. In the illustrated form, the interlocking is effected by providing contact 21 with grooves 27 into which the plates 26 extend, the plates being riveted to member 24. The plates 26 are so located with respect to the contact 21 that they do not engage with the bottom of the grooves 27, the side wall of aperture 28 thus serving as the bearing for contact 21 during its rotation relatively to member 24.

Any suitable means may be provided for effecting switch opening and closing movement of the member 24. In the illustrated switch an operating bail 28 is journaled in the casing side walls. The bail includes an offset or crank portion 29 positioned in a recess 30 in the member 24, and it also includes an externally located handle portion 31. It is apparent that oscillation of the handle 31 will serve to cause reciprocation of the member 24 which in turn will move the contact 21 into and out of bridging relationship with the contacts 8 and 11.

When contact 21 is in its circuit closing position, as shown in Fig. 3, the contacts 8 and 11 resiliently press against it with a relatively high contact pressure per unit of contact area, the contacting areas being at approximately the center of the contacts 8 and 11 and at the central portions of the convex end surfaces of the contact 21. As contact 21 is withdrawn from between contacts 8 and 11 and as actual physical engagement between contacts 8, 11, and 21 is broken, an electrical arc will be drawn between the edges of the contacts. Thus no burning or pitting of the normal contact areas will result. It has been found that contact 21 rotates very slightly about its own axis, which in the construction illustrated extends in the direction of the resilient movement of the contacts 8 and 11, and always rotates in the same direction as it is withdrawn from between contacts 8 and 11; for example, in the case of one switch tested, one complete revolution of contact 21 was effected for approximately every one hundred operations of the switch. Due to this rotation any burning or pitting of the peripheral edges of contact 21 will not be localized at one place, but will be uniformly distributed around the edges. The life of contact 21, as measured by the number of times it can make and break a circuit before becoming too badly burned for efficient operation, is therefore much longer than that of a similarly contoured contact which is not rotatably mounted.

At present the reason for the rotation of the bridging contact is not definitely known, but it is thought to be due to the edges of contacts 8 and 11 gripping the bridging contact at points on its edges slightly below or above (as viewed in Fig. 3) a horizontal line through its center of rotation. Such gripping would exert an off-center restraining force on the contact to thus cause it to rotate as it finally emerges from between the opposed contacts 8 and 11. Such off-center gripping would result if the faces of the opposed contacts were not in vertical parallelism, which is probably the case. It has also been found that a new bridging contact when reciprocated in a switch not carrying current will

require a greater number of reciprocations to effect one revolution of the contact than when the switch is carrying current. This has led to the belief that the slight burring of the contact edges caused by arcing enhances the gripping action.

In Figs. 6, 7, and 8 I have shown an alternative form of switch unit embodying the principles of the invention. While no casing or operating bail has been shown in these figures it will be understood that the switch unit is adapted to be mounted in a casing similar to that illustrated in Fig. 1 and is also adapted to be operated by a similar type of bail.

The insulating base of the switch unit preferably comprises two parts 51 and 52. Part 51 is slotted at 53, the slots being wider at one end than at the other. Contacts 54 are provided adjacent one side wall of the slots 53 and are formed with offset portions 55 which are secured to the bottoms of the slots by screws 56. Suitable binding posts, such as screws 57, serve for connecting contacts 54 in a circuit. Contacts 58 are located in opposed relation to contacts 54 and are secured in place by screws 59 threadably engaged in holes in offset portions 60. The contacts 54 and 58 are preferably formed of spring bronze and have limited resilient movement toward and away from each other. The bottoms of slots 53 are grooved as indicated at 61.

As is apparent from Figs. 6 and 7, part 52 of the insulating base has a substantially greater projected area than part 51. Fuse receiving means, such as the clips 62 and 63, are secured to the top surface of part 52. The clips 62 preferably include offset metallic conductors 64 which are clamped to contacts 58 by nuts 65. This clamping construction also serves to hold the parts 51 and 52 in assembled relationship. The clips 63 include binding posts 66. The underside of that portion of the part 52 which projects beyond part 51, is provided with grooves which cooperate with grooves 61 to form guide grooves.

Bridging contacts 67, similar to those shown in Figs. 1-5, are provided for making and breaking the circuits through the contacts 54 and 58. Contacts 67 are carried by reciprocable insulating members 68 and are secured thereto for rotation only about axes passing through their convex contact surfaces in any desired manner, although the construction illustrated is the same as that shown in detail in Figs. 4 and 5. The members 68 are adapted to be reciprocated in the guide grooves in the base.

The remarks made above with respect to the operation of the embodiment shown in Figs. 1-5 are equally applicable to the embodiment of Figs. 6, 7, and 8.

What I claim is:

1. In a switch, the combination of a base, a pair of spaced opposed contacts mounted on the base and having limited resilient movement toward and away from each other, a member movable between said contacts, and a bridging contact carried by said member for making and breaking a circuit between said pair of spaced contacts, said bridging contact having convex contact surfaces and being rotatable relatively to said member only about an axis passing through said convex contact surfaces.

2. In a switch, the combination of a base, a pair of spaced opposed contacts mounted on the base and having limited resilient movement toward and away from each other, a member movable between said contacts, and a bridging con-

5 tact carried by said member for making and
breaking a circuit between said pair of spaced
contacts, said bridging contact having convex
contact surfaces and being rotatable relatively
10 to said member only about an axis extending in
the direction of the resilient movement of said
pair of spaced contacts.

15 3. In a switch, the combination of a base, a
pair of spaced opposed contacts mounted on the
base and having limited resilient movement to-
ward and away from each other, a member mov-
able between said contacts, and a solid metallic
bridging contact carried by said member for
making and breaking a circuit between said pair
of spaced contacts, said bridging contact having
convex contact surfaces and being rotatable rel-
atively to said member only about an axis passing
through said convex contact surfaces.

4. In a switch, the combination of a base, a
pair of spaced opposed contacts mounted on the
base and having limited resilient movement to-
ward and away from each other, a member mov-
able between said contacts, a bridging contact
5 carried by said member for making and breaking
a circuit between said pair of spaced contacts,
said bridging contact having convex contact sur-
faces and being rotatable relatively to said mem-
ber only about an axis passing through said con-
vex contact surfaces, and means secured to said
10 member interlocked with the bridging contact for
preventing separation of the latter from said
member.

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