Dec. 1, 1942. O. D. VON MEHREN 2,303,516

CIRCUIT INTERRUPTER

Filed Sept. 9, 1939

Fig. 1.

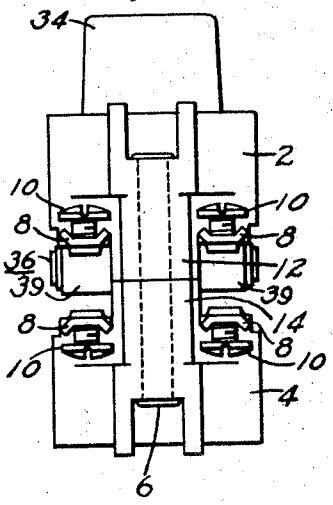


Fig. 2.

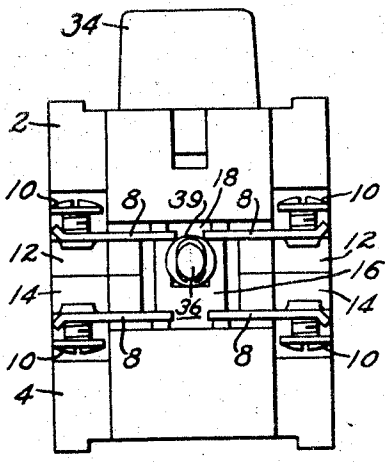


Fig. 3.

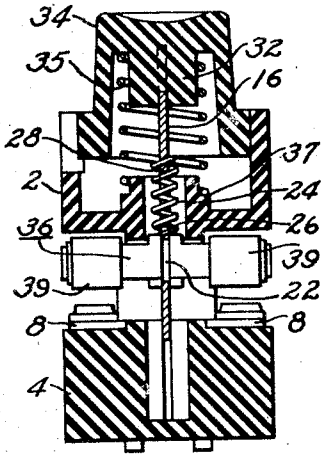


Fig. 4.

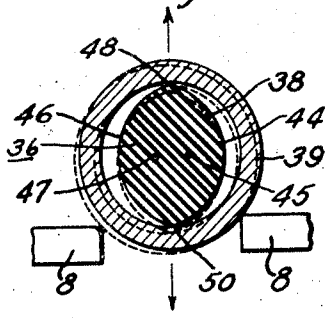


Fig. 5.

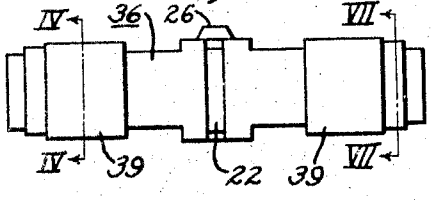


Fig. 6.

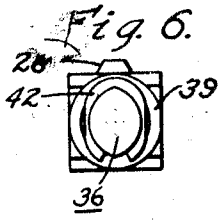


Fig. 8.

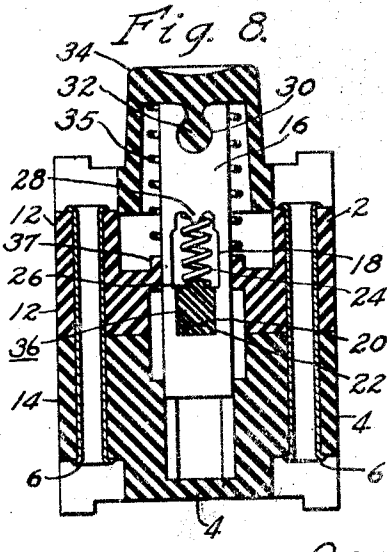
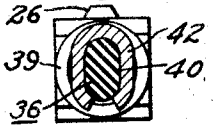


Fig. 7.



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CIRCUIT INTERRUPTER

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Application September 9, 1939, Serial No. 294,071

11 Claims. (Cl. 200—16)

My invention relates generally to circuit interrupters, and more particularly to that type employing a movable bridging contact member.

In switches of the type employing a movable bridging contact member, it has always been a problem to obtain uniform contact of the movable bridging member and the bridged contacts. This has been difficult to obtain without resorting to relatively expensive precision machining operations, or equally expensive, complex contact structures.

It is accordingly, an object of my invention to provide a movable contact bridging member of novel and simple design which is constructed to automatically obtain uniform contact irrespective of any disalignment of the contacts to be bridged.

A preferred form of my invention will be described in connection with a push-button type of switch for which it is particularly adapted, in view of the small space factor considerations of such switches.

It is, therefore, an object of my invention to provide a pushbutton switch having a novel movable contact member which is capable of automatically conforming to the alignment of its cooperating fixed contacts.

It is a further object of my invention to provide a pushbutton type switch for the selective control of a plurality of circuits which embodies means for obtaining an even distribution of pressure on the several contacts.

It is a still further object of my invention to provide opposed pairs of contacts with a movable bridging contact which is adapted to exert even pressure on the bridging contacts irrespective of any disalignment of the contacts of each pair.

A still further object of my invention is to provide in a multipolar switch of the type having plural movable bridging contacts adapted to bridge respective sets of contacts, a movable contact structure wherein each contact is relatively laterally movable independently of the other contacts and without effecting any of the other contacts, to automatically compensate for any disalignment in the contacts to be bridged.

These and other objects of my invention will become more apparent upon consideration of the following detailed description of a preferred embodiment, taken in connection with the attached drawing, in which:

Figure 1 is an end view of a pushbutton switch embodying my invention,

Fig. 2 is a side view of the switch shown in Fig. 1;

Fig. 3 is a central, vertical, cross-sectional view of the switch shown in Figs. 1 and 2;

Fig. 4 is an enlarged cross sectional view of the contact bridging member and its support taken on the line IV—IV of Fig. 5;

Fig. 5 is an elevational view of the bridging contact support with the bridging contacts shown in assembled positions thereon;

Fig. 6 is an end view of the structure shown in Fig. 5;

Fig. 7 is a cross sectional view taken on the line VII—VII of Fig. 5; and

Fig. 8 is a longitudinal, cross sectional view of the switch shown in Figs. 1 and 2, and taken at right angles to the section of Fig. 3.

In general, my invention is illustrated in conjunction with a pushbutton switch structure having spaced pairs of fixed contacts, the contacts of each pair being adapted to be bridged by a rectilinearly movable contact which is actuated by a pushbutton. The bridging contact is mounted relative to its support in such a manner as to be laterally, pivotally movable with respect thereto, in order to automatically compensate for any disalignment of the fixed contacts so that uniform contact pressures may be obtained at all times.

The switch, as shown in Figs. 1 to 3 and 8, includes an upper insulating supporting structure 2 and a lower insulating supporting structure 4 having confronting contacting end portions 12 and 14, respectively. The supporting structures are secured together by tubular rivets 6 which pass through apertures formed in the end portions 12 and 14, and the rivets have their end portions turned-over or riveted, to secure the supporting portions together. The rivets 6 are hollow to accommodate bolts by which the switch may be secured to any desired support. Each of the supporting structures carries two pairs of spaced contacts 8, secured thereto in any desired manner, such as by riveting, with each pair being located at each side of the supporting portions in horizontal and vertical alignment. Each contact 8 has at its outer end a terminal screw 10 which is threadedly engaged in an aperture formed in the outer ends of the contacts for securing an electrical lead wire thereto. The switch thus is provided with eight contacts enabling it to control four different circuits. Obviously, any desired number of contacts could be employed, and it should be understood that the invention is not limited to the particular number shown.

As seen, particularly in Figs. 3 and 8, a sliding, button supporting plate 16 is mounted for vertical sliding movement in the lower supporting

structure 4, and includes a substantially central aperture 18 having a reduced lower portion 20. The reduced aperture portion 20 is adapted to receive the rectangular reduced portion 22 of the movable contact support 36. Thus, when the device is assembled the movable contact support may be inserted endwise through the enlarged portion 18 of the sliding plate aperture until its reduced portion 22 is brought to a position where it can be moved downwardly into the reduced rectangular aperture portion 20. The support 36 is maintained in this position relative to the sliding plate 16 by means of a coiled compression spring 24, which is compressed between the support 36 and the upper end of the aperture 18. A knob 26 is provided on the support 36, and a positioning tab 28 is formed integral with the sliding plate 16 at the upper end of the aperture 18, to maintain the spring 24 in the position shown in Figs. 3 and 8. The upper end of the sliding plate 16 is formed with an inwardly extending opening having an enlarged inner portion 30 for receiving an integral enlargement 32 provided in a hollow pushbutton 34, to anchor the push-button and sliding plate 16 for movement together. The push-button is generally of inverted cup-shape form, as shown in Figs. 3 and 8. The push-button sliding plate, and consequently the movable contact support 36, are maintained in an upper position by a coiled compression spring 35 which is compressed between the inner side of the push-button 34 and an abutment portion 37 provided on the supporting member 2. Upward movement of the push-button is, of course, limited by engagement of the movable contact with the upper fixed contacts 8. The supporting members 2 and 4 and the push-button 34, as well as the movable contact support 36, are all formed of a suitable insulating material, preferably some moulded insulating material.

The movable contact support 36 includes outer reduced portions 38 for telescopically receiving the bridging contact members 39, and grooved outer end portions 40 for receiving a collar 42, which is bent about the ends of the support in the grooves 40 to prevent movement of the bridging contacts 39 off the ends of the support 36. The collars 42 are formed of any suitable bendable metallic material such, for example, as copper or a copper alloy. The reduced portions 38 for receiving the bridging contacts are formed as shown in Fig. 4, with opposite arcuate side portions 44 and 46. The bridging contact, as appears from these figures, is substantially cylindrical in form, and the arcuate sides 44 and 46 of the support 36 are less than semi-circular segments and have the same radii as the inner circumference of the contacts 39, but their centers are offset to the opposite sides of the bridging contact center as shown at 45, which is the center for the arc of side 46, and 47, which is the center for the arc of side 44. This construction provides opposed line pivotal portions 48 and 50 on the supporting member. Obviously, the sides of the supporting member could be other than arcuate in form if desired, it being necessary only to provide the line pivotal portions 48 and 50, at opposite sides of the support in the line of motion of the supporting member and it is only necessary that the remaining portions of the supporting member be spaced from the inner wall of the bridging contact, a substantial amount to allow for some relative lateral movement.

In the operation of this switch, reference will be had to Fig. 4 where there is shown diagrammatically on an enlarged scale, the contacts 8 which are slightly offset with respect to each other. The bridging contact and support are shown in a full line position, wherein, assuming that the support has been moved downwardly in the direction of a lower arrow, the bridging contact has just contacted the right-hand fixed contact 8 and is not yet in engagement with the other contact 8. It is obvious that continued downward movement of the bridging contact support 36 will cause the bridging contact to pivot about the lower edge 50 of the contact support until the parts assume the position shown in dotted lines in Fig. 4. Due to the fact that the contact support 36 at its widest portion, that is, the distance between points 48 and 50 (Fig. 4), is slightly less than the internal diameter of the bridging contact, the latter is capable of a limited lateral pivotal movement with respect to its support either about the point 48 or the point 50. The action above described, when the bridging contact is moving downwardly, also obviously will take place in the same manner when the contact is moving upwardly. It should be noted that the lateral pivotal movement of the contact 39 at one end of the support 36, is independent of, and does not affect the other contact 39. Upon upward movement of support 36, lateral pivoting of the bridging contact 39 will take place about the pivot point 48, rather than the pivot point 50.

It is thus seen that I have provided a moving bridging contact structure which, although mounted for movement in a fixed path, is capable of limited lateral pivotal movement with respect to the contact support, so as to automatically compensate for any irregularities or disalignment of the fixed contacts to be bridged. This structure is particularly adapted for use in a switch of the double-throw, multi-pole push-button type wherein a plurality of pairs of fixed contacts are positioned to be bridged by a single movable contact carrying member with certain of the pairs of fixed contacts arranged to be bridged at each end of the path of movement of the movable contacts, and the movable contact support may carry a plurality of moving contacts for bridging duplicate sets of fixed contacts. To obtain the lateral limited pivotal movement of the bridging contact members independently of each other, the contact support is made roughly elliptical in form as shown in Fig. 4. Inasmuch as these supporting parts of molded insulating material are relatively small and relatively physically weak, the particular cross section of contact support shown in Fig. 4 is structurally stronger than any other design capable of producing a like result.

Having described a preferred embodiment of my invention in accordance with the patent statutes, I desire that it be understood that I wish my invention to be given the broadest possible interpretation and be not limited to the particular embodiment described. Inasmuch as it will be obvious, particularly to persons skilled in the art that many changes and modifications may be made in this particular structure without departing from the broad spirit and scope of my invention, I desire that my invention be not limited except by what is expressly stated in the following claims.

I claim as my invention:

1. In a switch, a substantially cylindrical contact, a support therein having opposite sides thereof in the form of less than semi-circular arcs of the same radius as the inner surface of

said contact, with said arcs intersecting to form opposite edges of said support.

2. In a switch, a tubular contact, a support therein having opposite sides arcuate in cross section, said arcs being less than 180°, and intersecting to form opposite edges of said support.

3. In a switch, an insulating base member having a transverse opening extending therethrough, opposite sides of said member adjacent the ends of said opening having depressions in which are supported spaced contacts, movable actuating means extending substantially transversely into said opening, and a bridging contact support in said opening extending longitudinally thereof carrying self-aligning bridging contacts adjacent opposite ends thereof, said contact support operatively associated with said actuating means so as to be actuated thereby to move said bridging contacts into and out of engagement with said spaced contacts.

4. In a switch, an insulating bridging contact supporting member elongated in transverse section to provide at least one sharp side edge, a contact sleeve of conducting material freely telescoping over said supporting member to be supported thereon, the greatest transverse dimension of said member being on the order of but slightly less than the internal diameter of said sleeve, whereby said sleeve may have limited pivotal movement laterally about said edge.

5. In a switch, a tubular contact, a support on which said contact is mounted, said support having opposed sharp edge portions positioned within said contact and spaced apart a distance slightly less than the internal diameter of said contact so as to be loosely engageable with opposed inner surfaces of said contact, and the distance between said edge portions constituting the greatest cross-sectional dimensions of said support.

6. In a switch, rigid spaced contacts, a bridging contact support mounted for substantially rectilinear movement toward and away from said spaced contacts and in a plane extending at an angle to the plane of said spaced contacts, said support having a sharp edge portion facing the space between said pair of contacts, a tubular bridging contact having a transverse dimension greater than the space between said spaced contacts, said bridging contact loosely telescopically mounted over said support so as to be pivotal on said edge portion laterally, to automatically compensate for any disalignment of said pair of contacts upon engagement therewith by movement of said support towards said spaced contacts.

7. In a switch, spaced pairs of spaced rigid contacts, a support movable between said pairs of contacts and including a contact supporting portion movable in a path substantially in alinement with the spaces between the contacts of each of said pairs of contacts and having sharp pivot edge portions facing the spaces between said pairs of contacts, respectively, and a tubular bridging contact having a transverse dimension greater than the space between said spaced contacts, said bridging contact loosely telescopically mounted on said support for limited lateral pivotal movement about said edge portions.

8. In a switch, a movably mounted contact support of a molded insulating material, a tubular contact telescopically mounted on said movable support, one transverse dimension of said support being on the order of but slightly less than the internal diameter of said contact, and the dimension of said support at substantially right angles to said one dimension being substantially less than said one dimension, whereby said contact is capable of limited lateral movement relative to said support.

9. In a switch, an insulating elongated bridging contact supporting member having end portions elongated in cross section to provide sharp opposed side edge portions, and a plurality of tubular bridging contacts loosely telescopically mounted on said end portions, respectively, for independent limited lateral movement.

10. In a switch, a plurality of spaced pairs of spaced contacts with all of said contacts located in substantially the same plane, an elongated movable contact supporting member mounted for movement in a path extending at an angle to said plane toward and away from said contacts, a plurality of spaced tubular bridging contacts mounted on said supporting member, one for each of said pairs of contacts, each of said bridging contacts being mounted for independent, limited lateral pivotal movement on said supporting member.

11. In a switch, a tubular contact member, a supporting member for said contact member positioned therein, said supporting member being elongated in section to provide opposite sharp side edges spaced apart a distance slightly less than the greatest internal dimension of said contact member so that said members are relatively movable laterally thereof, and opposite sides of said supporting member between said edges being of the same contour as the interior surface of said contact member for limiting said relative movement.

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