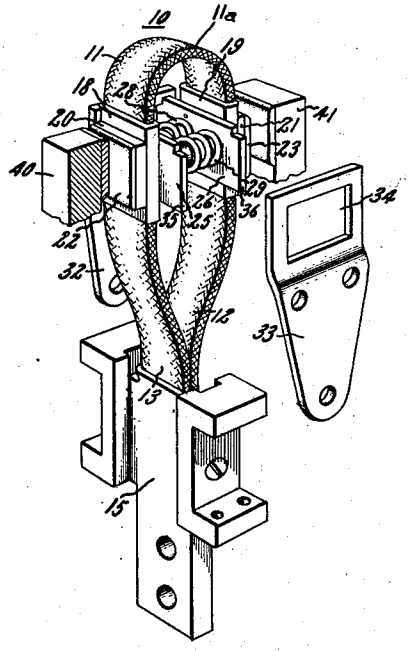
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ELECTRIC SWITCH

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ELECTRIC SWITCH

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My invention relates to electric switches provided with stationary and movable contacts, more particularly to circuit controllers for reversing the polarity of the field windings or armatures of traction motors, and has for an object the provision of an inexpensive and rugged movable contact which is efficient in operation.

In electrical switches or circuit controllers of the type arranged to carry currents of large magnitude much is yet to be desired in the arrangement of the flexible conductor to which are secured the movable contacts. In circuit controllers of small current capacity the heating of the contacts and the consequent loss of power will be negligible, but in switches where large current is carried the heating and loss of power due to poor contact between the parts is often considerable. To reduce this heating it is necessary to reduce the resistance of the parts as well as to insure at all times a minimum contact resistance. It is therefore a further object of my invention to provide a construction wherein a minimum resistance exists between the movable contacts and their associated stationary conductors.

In carrying out my invention in one form, the movable contact comprises flexible electrical conductors connected together at one end and having spaced portions forming contact members, with a spring assembly mounted between the spaced portions of said conductors to provide for a strong contact pressure.

For a more complete understanding of my invention, reference should now be made to the accompanying drawing wherein I have shown in exploded perspective a movable switch member embodying my invention.

Referring to the drawing, I have shown my invention in one form as applied to a switch comprising a movable switch member 10 comprising a single or one-piece flexible braided conductor 11 having its ends 12 and 13 secured as by welding or brazing to a stationary conductor 15. As shown, the flexible conductor 11 preferably formed of copper or other suitable low-resistance material forms a closed loop above the stationary conductor 15, although the upper bend 11*a* of this loop can be omitted without departing from my invention. Contact members are secured to the conductor near the upper end of the loop, i. e., to the spaced portions of the conductor, by means of the copper tubes 18 and 19 which tubes are cold forged over the flexible conductor so as to form intimate electrical connection between the tubes and the conductor. The copper spacing blocks 20 and 21 are secured integrally with the tubes 18 and 19 on the outermost sides of the loop, and the contact members, shown as plates 22 and 23, preferably made of silver, are integrally secured in turn to the spacing blocks 20 and 21. It will be observed that each contact plate is directly connected to the stationary conductor 15 by a separate conductor formed by its branch of the loop, although by reason of the current path afforded by the upper bend 11*a* of the loop, current can flow through both branches of the looped conductor to the respective contact plates.

A high contact pressure is secured by means of a spring assembly including a pair of spring seats or guides 25 and 26 secured to the inner sides of the tubes 18 and 19. A pair of helical compression springs 28 and 29 mounted on the spring guides, as by lugs carried by the guides and inserted in the ends of the springs, normally exert a pressure in a direction to separate the contact plates 22 and 23. The spring seats 25 and 26 with the springs 28 and 29 mounted between them are maintained in position and the contact assembly moved as a whole by means of a pair of operating arms 32 and 33. These operating arms are identical in construction. It will be observed that the operating arm 33 is provided with a rectangular opening 34 through which the notched ends 35 and 36 of the spring seats or guides 25 and 26 extend, and are seated, when the contact member is in open circuit position, against opposite sides of the opening by the pressure of the springs 28 and 29. The opposite ends of the guides 25 and 26 are secured in a similar manner by the arm 32. The movable switch member 10 can be moved from one circuit controlling position to another into engagement with one or the other of the spaced stationary contacts 40 and 41 by means of an operating member (not shown) secured to and carrying the operating arms 32 and 33, or the switch member can be moved to an intermediate open circuit position between the two stationary contacts. In closing the circuit by engagement with one or the other of the two stationary contacts, the movement of the arms 32 and 33 is continued a short distance after engagement is made with the stationary contact whereby the springs are compressed somewhat to apply the force of the springs to secure the contacting surfaces together. It will be observed that during this continued movement of the arms 32 and 33 to apply the pressure of the springs to the contacting surfaces, the spring guide 25 or 26 adjacent the engaged contact plates 22 or 23 slides in the rectangular openings in the arms 32 and 33.

Inasmuch as the compression springs 28 and 29 are located directly back of the contact plates 22 and 23, it will be seen that the contact pressure exerted by these springs serves to maintain the contact plates in engagement with the maximum surface of the cooperating stationary contacts 40 and 41. For example, if the contact surfaces wear down more at one side than at the other side the mounting of the contact plates on the flexible conductor permits a corresponding change in the position of the movable contact

plates so that a minimum contact resistance is secured by maintaining the maximum contact area between the stationary and movable contacts.

If the upper bend 11a of the loop above the contact plates 20 and 21 is omitted, it will be observed that the spring assembly and the operating arms will function in the same manner as before to insure the predetermined contact pressure. However, it will be noted that both branches of the flexible conductor 11 will not then conduct current directly to the respective contact plates 21 and 22.

While I have shown a particular embodiment of my invention, it will be understood of course that I do not wish to be limited thereto since many modifications may be made, and I therefore contemplate by the appended claims to cover any such modifications as fall within the true spirit and scope of my invention.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. In a switch, a movable switch member comprising a flexible conductor, a contact plate secured to one side of said conductor, a spring guide secured to the other side of said conductor opposite said contact plate, a compression spring having one end supported by said spring guide, a second spring guide supporting the other end of said spring, and an operating member connected to said spring guides for operating said switch member and for supporting said guides.

2. In a switch, a movable switch member comprising a flexible conductor, a contact plate secured to one side of said conductor, a spring guide secured to the other side of said conductor opposite said contact plate, a compression spring having one end supported by said spring guide, a second spring guide supporting the other end of said spring, and switch operating arms provided with openings through which adjacent ends of said guides extend for supporting said guides, said openings permitting movement of said guides independently of said arms to compress said spring.

3. In a switch provided with a stationary contact, a movable switch member comprising flexible conductors electrically connected together at one end and having spaced portions, a movable contact secured to an outside face of one of said conductors, a compression spring, spring guides secured to said spaced portions of said conductors for supporting said spring, and an operating member connected to said guides for moving said switch member to bring said movable contact into engagement with said stationary contact and for thereafter applying the force of said spring to said movable contact, said operating member forming a support for said guides.

4. In an electric switch, stationary contacts therefor, a stationary terminal member, a movable switch member comprising a flexible conductor having its ends secured together to form a loop, means for securing said ends of said loop to said terminal member, movable contact members secured to opposite sides of said loop, a spring associated with said movable contact members for biasing said movable contact members towards said stationary contacts, and an operating arm for said switch member, said operating arm normally restraining said movable contact members against movement by said spring towards said stationary contacts.

5. In an electrical switch, a pair of stationary contacts, a switch member comprising a one-piece flexible conductor having its ends secured together to form a loop of low electrical resistance, a stationary terminal, means for securing said ends of said loop to said stationary terminal, contact members secured to opposite sides of said loop, biasing means interposed between said contact members, operating means for supporting and moving said flexible loop relative to said stationary terminal, said loop being movable to engage one or the other of said contact members with one or the other of said stationary contacts, said loop forming a low resistance path to said stationary contacts and preventing heating of said biasing means.

6. In an electric switch, stationary contacts therefor, a movable switch member comprising a flexible conductor having its ends secured together to form a loop, movable contact members secured to opposite sides of said loop, spring guides within said loop and associated with each of said contact members, a compression spring mounted between said spring guides, and operating means connected to said guides for operating said switch member to bring a selected one of said movable contact members into engagement with a selected one of said stationary contacts.

7. An electrical switch member comprising a single flexible conductor having its ends secured together to form a closed loop, contact members secured to opposite sides of said loop, a spring guide associated with each of said contact members, compression springs supported by said spring guides within said loop, a pair of operating arms arranged on opposite sides of said loop for supporting said spring guides and for limiting the action of said compression springs in separating said contacts.

8. In an electric switch, an electrical switch member comprising a flexible conductor having its ends secured together to form a loop, contact members secured to opposite sides of said loop, a spring guide associated with each of said contact members, compression springs supported within said loop by said spring guides, a pair of operating arms on opposite sides of said loop for supporting said guides and for limiting the action of said compression springs in biasing said contact members away from each other, said operating arms being movable to move said switch member from one position to another and to compress said springs.

9. In an electric switch, a stationary contact, a cooperating movable switch member comprising a flexible conductor having its ends secured together to form a closed loop, a movable contact secured to one face of said loop, a spring guide within said loop and operatively associated with said contact, a second spring guide on the opposite side of said loop, a compression spring supported within said loop between said spring guides, and an operating member connected to said spring guides for operating said movable contact into engagement with said stationary contact, and for thereafter compressing said spring upon continued movement of said operating member to apply a predetermined pressure to said contacts.

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