Jan. 3, 1933. W. M. AUSTIN 1,893,046

CIRCUIT INTERRUPTER

Filed Nov. 2, 1927 2 Sheets-Sheet 1

Fig. 1.

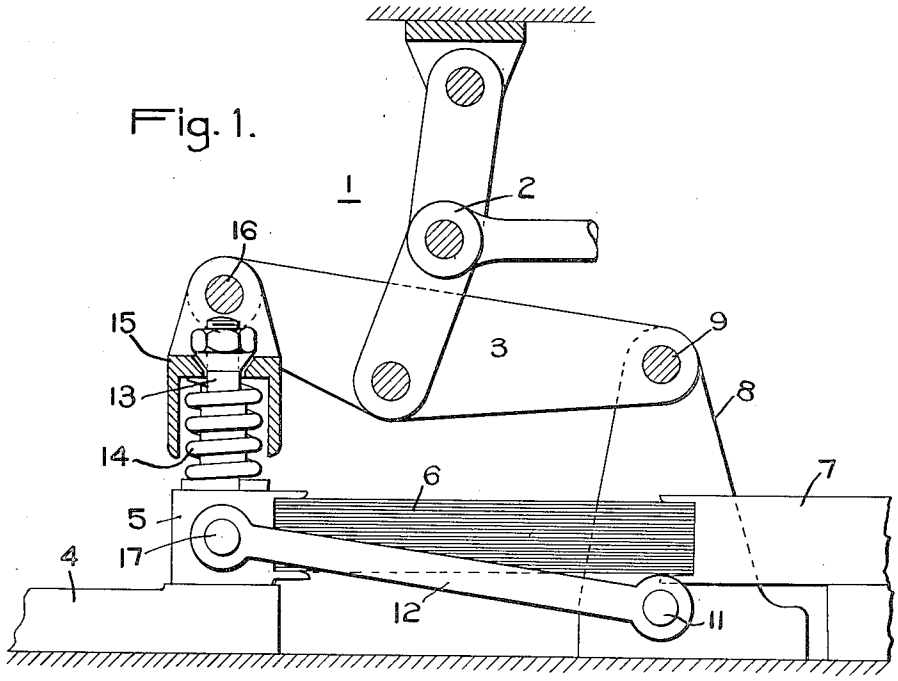
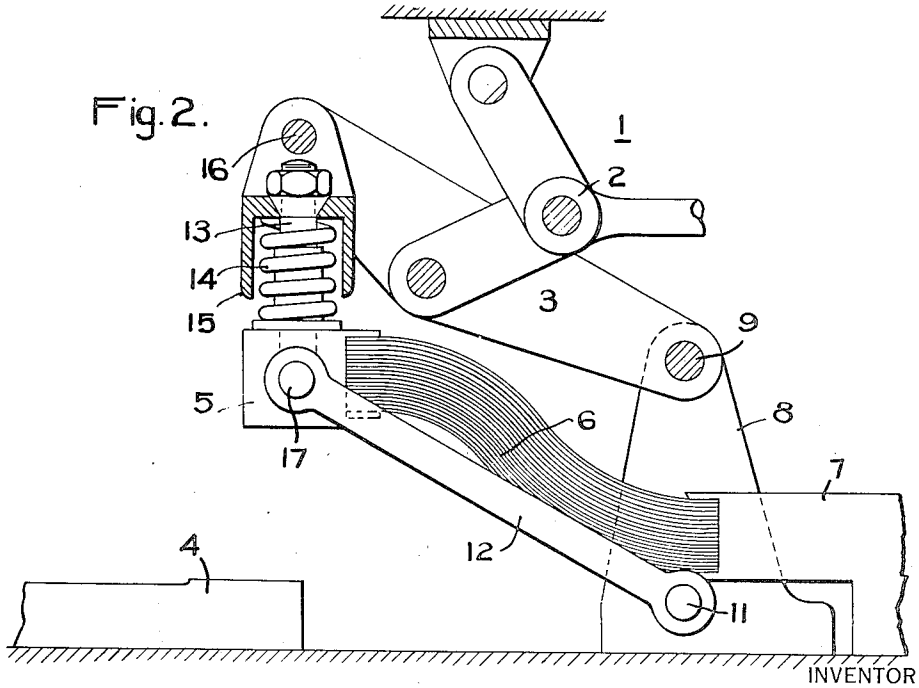


Fig. 2.



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Fig.3.

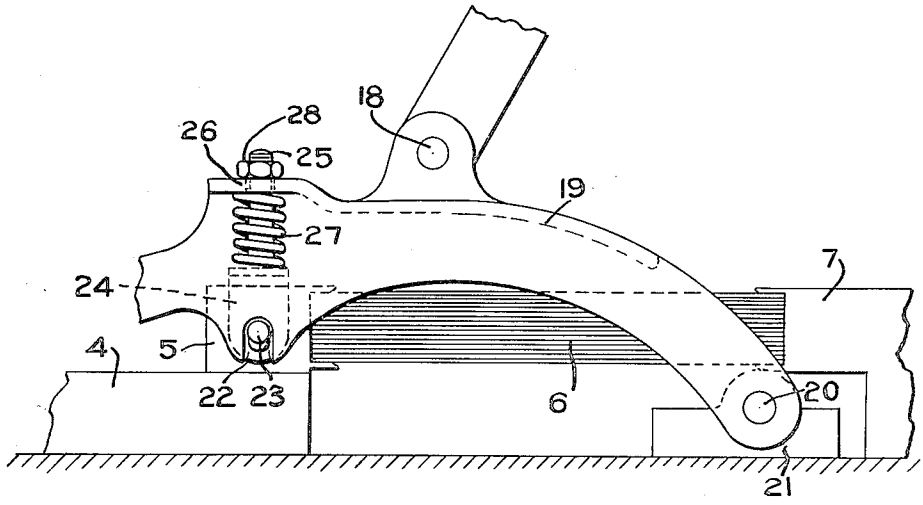


Fig.4.

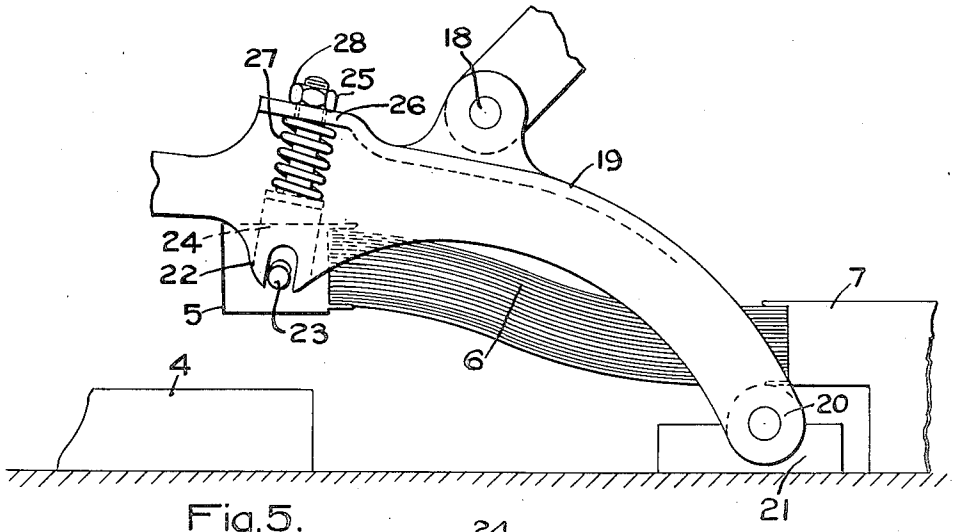
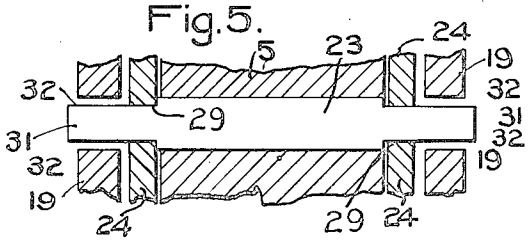


Fig.5.



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UNITED STATES PATENT OFFICE

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CIRCUIT INTERRUPTER

Application filed November 2, 1927. Serial No. 230,455.

My invention relates to circuit interrupters and more particularly to the separable contact members thereof.

One object of my invention is to provide a circuit interrupter with contact members that shall separate at one point only.

Another object of my invention is to provide a circuit interrupter, the conducting portions of which shall comprise a minimum number of united conducting elements.

A further object of my invention is to construct a circuit interrupter that shall have a minimum drop in potential through all of the current-carrying parts.

A still further object of my invention is to provide a circuit interrupter that shall be compact in design and shall occupy a minimum amount of space for a maximum current-carrying capacity.

Heretofore, in constructing circuit interrupters, a laminated bridging member was employed to shunt a pair of contact members. This necessitated the breaking of the current at each of the said contact members and, upon completing the circuit, the bridging member formed an abutting contact at each of the said contact members. As contacts of this type offer resistance to the passage of current, they necessarily detract from the efficiency of its operation by causing heat at these points. The surfaces of the contact member and the cooperating surfaces of the bridging member become corroded and particles from the surrounding atmosphere lodge thereon, causing poor contact and increase still further the voltage drop across the current-carrying parts of the circuit interrupter.

By employing a circuit interrupter of my present design, I am able to reduce the voltage drop across the contact members by employing a single pair of separable contact elements. My design is further advantageous because of the special laminated current-carrying construction which retains the surfaces of the contact members in approximately parallel relation. This enables one unskilled as a mechanic to brighten or cleanse the said surfaces by employing a cutting tool having parallel surfaces. By the mere passage of this tool between the surfaces, true and clean abutting faces result.

My design will best be understood from the description and the accompanying drawings, in which:

Figure 1 is a view, partly in section and partly in elevation, of a circuit interrupter embodying my invention with its contact members in closed position.

Fig. 2 is a similar view of the circuit interrupter of Fig. 1, with the contact members in open position,

Fig. 3 is a view, in elevation, of another embodiment of my invention, with the contact members in closed position,

Fig. 4 is a view similar to Fig. 3 except that the contact members are in open position, and

Fig. 5 is a fragmentary sectional view showing a detail of the embodiment illustrated in Figs. 3 and 4.

My invention comprises, in general, a circuit interrupter 1 having operating rod 2, link 3, stationary contact member 4 and moving contact member 5. The contact members 4 and 5 present solid surfaces to each other and are the single primary means for opening a current with my type of circuit interrupter.

The contact member 4 is in circuit with a terminal member (not shown) which is one of the means for connecting the circuit interrupter in the circuit to be controlled. The moving contact member 5 is connected, by flexible conductor 6, to a terminal 7 which is the other means of completing the circuit when installing my circuit interrupter. The flexible conductor 6 is constructed from a plurality of thin laminations of conducting material of approximately the same length and thickness. At one end, these laminations, are either joined to the contact member 5 or, alternatively, they may be welded together for a short length to form a solid structure similar to the contact block 5.

Upon movement of the moving contact member 5, the shunt 6 bends freely in a reverse curve without change of length or buckling of the individual laminations. The said curves have large radii, thereby preventing over-stressing any of the said lamina-

tions. The foregoing construction assures long life of the flexible member and, at the same time, functions to retain the surfaces of the moving contact member 5 substantially in parallel relation to the surfaces of the stationary contact member 4.

The means for supporting the movable contact 5 will now be described. A supporting member 8 supports one end of the lever 3 on a hinge 9 and is also the means for supporting a pin 11 that is the pivot point for a guide link 12. The moving contact member 5 is connected, through stud 13, spring member 14, spring cage 15 and pin 16, to the other end of lever 3. A pin 17 attaches movable contact member 5 to the other end of the guide link 12.

Assuming the circuit interrupter to be in open position, as in Fig. 2, upon the movement of the closing mechanism 2, link 3 and, guide link 12 are moved in counter clockwise direction, carrying the contact block 5 downward, and maintaining the pins 16 and 17 always in vertical alinement. The surfaces of the abutting contact members 4 and 5 are thereby maintained substantially parallel at all times during the movement of the contact member 5.

As a result of the arrangement just described, both the lever system and the reverse-curve bend in the shunt 6, function to maintain the surfaces of the said contact members 4 and 5 approximately parallel. After the said surfaces meet, the further movement of the operating member 2 forces the spring cage 15 to slide upon the stud 13 and exert a pressure through the spring 14 on the moving contact member 5, thereby seating the surfaces securely and assuring a good conducting contact over their entire contact area.

Figure 3 shows another form which my invention may assume in which the guide link 12 is dispensed with and the approximate parallel relation of the contact surfaces is maintained solely by the fact that the flexible conductor 6 bends into a reverse curve. The structure in Fig. 3 comprises a pin 18 that operates an arm 19 supported by a hinge 20 on a base 21. The arm 19 is provided with slots 22 in which a pin 23 on the contact member 5 freely moves. The slot 22 in the arm 19 moves in an arc that approximates the movement of the pin 23 in the contact member 5 in its path of least resistance, which is that caused by the flexible conductor 6 bending in a reverse curve. It has been found that, when a force is applied to the moving contact member 5, permitting movement thereof without other restraint, the pin 23 of the contact member 5 moves in a curve almost identical to the arc described by the slot 22 of the arm 19. The pin 23 is provided with a clearance in the slot 22, permitting it to move in its said path of least resistance, thereby avoiding the possibility of excessive strains being set up in the flexible conductor 6.

The pin 23, as shown in Fig. 5, has a shoulder portion 29 at each of its ends. A bifurcated member 24 is provided with a bolt 25 extending upward loosely through an aperture 26 in arm 19. A spring 27 is placed over the bolt 26, between the member 24 and the inner portion of the arm 19, to press the contact member 5 downward upon contact member 4. The bifurcated member 24 is assembled upon the pin 23 that projects from each end of the contact member 5 and is the means of supporting the contact member 5 from the arm 19. By relative movement of the bolt 25 in the aperture 26 and of the pin 23 in the slots 22, after the contacts 4 and 5 are closed, the arm 19, acting through the spring 27, exerts a force upon the contact member 5. A nut 28 is employed on the bolt 25 for permitting a limited movement of the contact member 5, relative to the arm 19, when the contact members 4 and 5 are separated.

Assuming the circuit interrupter to be in open position, as in Fig. 4, with the surfaces of the contact members 4 and 5 maintained in approximately parallel relation by the reverse curvature in the shunt 6, when pressure is applied by the closing mechanism (not shown) to the pin 18, the arm 19 is moved in a counter clockwise direction and carries the moving contact 5 into abutting relation to the surface of the contact block 4. Up to this time, the pin 23 is positioned near the open end of the slot 22 because of the compression in the spring 27. When the moving contact member 5 comes to rest upon the stationary contact 4, the continued movement of the arm 19 compresses the spring 27, thereby applying a force to assure good contact between the surfaces of the contact members 4 and 5.

Accordingly, my circuit interrupter has current-carrying portions which comprise a minimum number of current-carrying members, thereby eliminating heating or loss in voltage due to the resistance that would be present at sliding contacts. A further novelty is the employment of a pair of solid separable surfaces in the primary current-carrying portions, thereby employing but a single opening in the main circuit to interrupt the current. This single-opening construction further decreases the possibility of heating and decreases the voltage drop through the contact members. By the employment of the parallel surfaces, repairs are easily and cheaply made when the contacts become corroded, thereby assuring bright clean contact surfaces and efficient operation of the current-carrying parts.

Furthermore, the operating mechanism required for the structure above described will be simple, resulting in a unit that occupies very little space.

It is to be understood that such changes in the form, arrangement and connection of the component parts of my invention may be made as shall fall within the scope of the appended claims.

I claim as my invention:

1. In an electrical switch, a fixed contact, a movable contact, a fixed terminal spaced from the movable contact, a pack of laminations having opposite end portions anchored to the movable contact and to said terminal, the spanning lengths of the laminations between the anchored portions being uniform, and means for separating the movable contact from the fixed contact, whereby said laminations maintain the movable contact substantially parallel to all of its positions.

2. In an electrical switch, fixed and movable contacts having abutting contact surfaces, a fixed conductor spaced from the contacts, a pack of laminations made of resilient conductive material and having opposite end portions anchored to the movable contact and to said conductor, the spanning lengths of the laminations between the anchored portions being uniform, and means for separating the movable contact from the fixed contact, whereby said laminations maintain the movable contact substantially parallel to all of its positions.

3. In an electrical switch, fixed and movable contacts having abutting contact surfaces; fixed structure spaced from the contacts and including a conductor; movable structure including a lever pivoted at one end of the fixed structure, a pack of laminations having opposite end portions anchored to the movable contact and to said conductor, and means carried by the other end of the lever for supporting the movable contact for pivotal movement so that it may be maintained substantially parallel to itself in all positions; and means for moving the movable structure to separate the contacts.

4. The combination as claimed in claim 3 wherein the supporting means is constructed and arranged to provide movement of the movable contact relative to the lever due to impact of the movable contact with the fixed contact and wherein such movement is resisted by a spring.

5. In an electrical switch, the combination of a stationary and a movable contact member having cooperating contact surfaces, a stationary conducting member, and a flexible connecting member comprising a plurality of laminations having their opposite ends connected to the movable contact member and the stationary conducting member, respectively, the flexible connecting member, the movable contact member and the stationary conducting member being arranged and connected in such manner that the connecting member bends in a reverse curve and maintains the contact surface of the movable contact member parallel to the contact surface of the stationary contact member upon movement thereof, and means for actuating the movable contact member in a direction transverse of said connecting member into and out of engagement with the stationary contact member.

6. In an electrical switch, the combination of a movable and a stationary contact member having cooperating contact surfaces, a stationary conducting member, a flexible conductor connecting the movable contact member to the stationary conducting member comprising a plurality of laminations secured at their respective ends to said connected members, and means for actuating the movable contact member into and out of engagement with the stationary contact member in a direction transverse of the flexible conductor, said last-mentioned means permitting the angular position of the movable contact member to be determined by the flexible conductor, whereby the flexible conductor bends in a reverse curve and maintains the contact surface of the movable contact member substantially parallel to the contact surface of the stationary contact member upon actuation of the movable contact member.

7. In an electrical switch, the combination of a movable and a stationary contact member having cooperating contact surfaces, a stationary conducting member, a flexible conductor connecting the movable contact member to the stationary conducting member comprising a plurality of laminations secured at their respective ends to said connected members, the ends of said laminations being disposed in substantially parallel relation in all positions of the movable contact member and means for actuating said movable contact member transversely of the flexible conductor into and out of engagement with the stationary contact member, said last-mentioned means permitting the contact surface of the movable contact member to remain in parallel relation to the contact surface of the stationary contact member, whereby the flexible conductor bends in a reverse curve and maintains the parallel relation of said contact surfaces.

8. In an electrical switch, the combination of a movable and a stationary contact member having cooperating surfaces, a stationary conducting member, a flexible conductor connecting the movable contact member to the stationary contact member comprising a plurality of laminations secured at their respective ends to said connected members, said laminations being substantially flat in one position of the movable contact member and the ends thereof being disposed in substantially parallel relation in all positions of the movable contact member, and means for actuating said movable contact member transversely of the flexible conductor into and out of en-

gagement with the stationary contact member without affecting parallel relation of the contact surfaces, whereby the flexible conductor bends in a reverse curve and maintains the contact surface of the movable contact member substantially parallel to the contact surface of the stationary contact member upon actuation of the movable contact member.

In testimony whereof, I have hereunto subscribed my name this 8th day of October 1927.

WALTER M. AUSTIN.