Feb. 2, 1943. C. G. KOPPITZ ET AL 2,309,909

ELECTRICAL SWITCH

Filed June 3, 1942 2 Sheets-Sheet 1

Fig. 1.

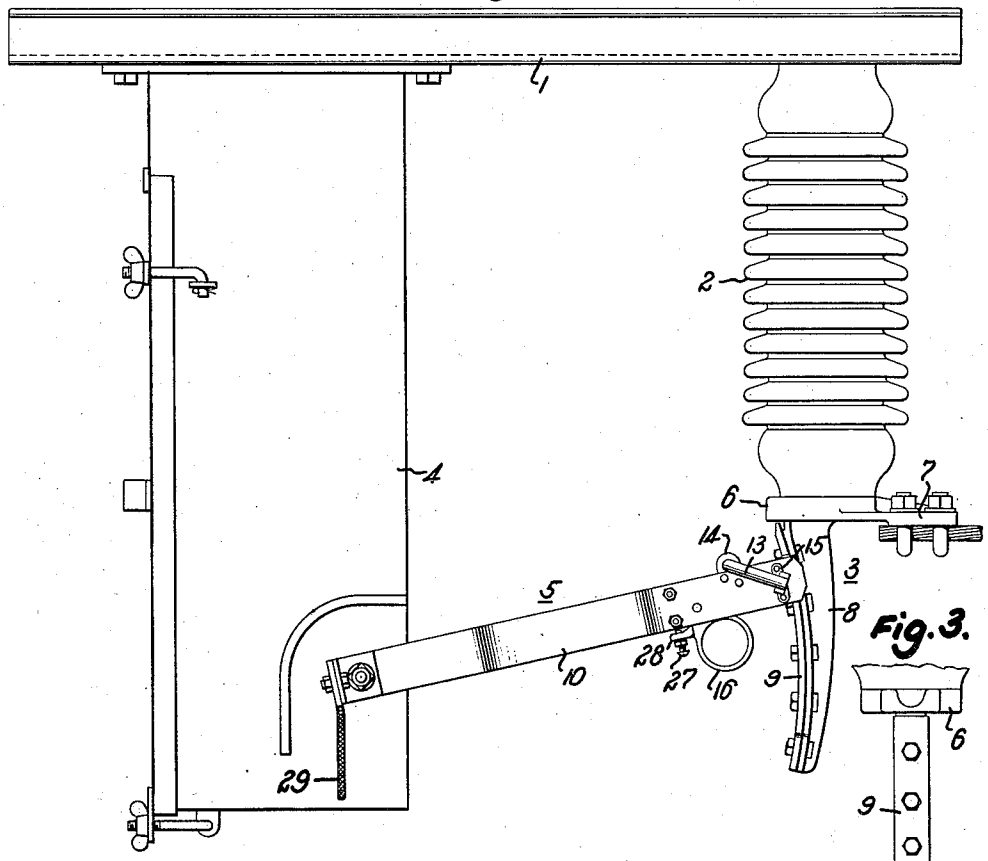
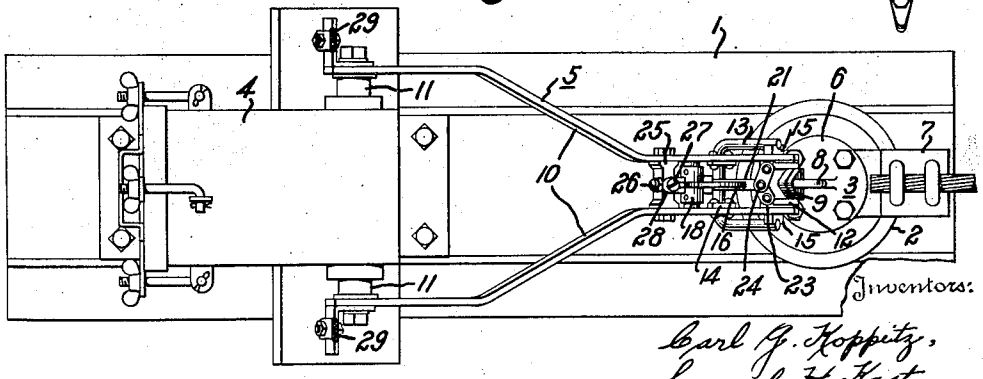


Fig. 3.

Fig. 2.



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Fig. 4.

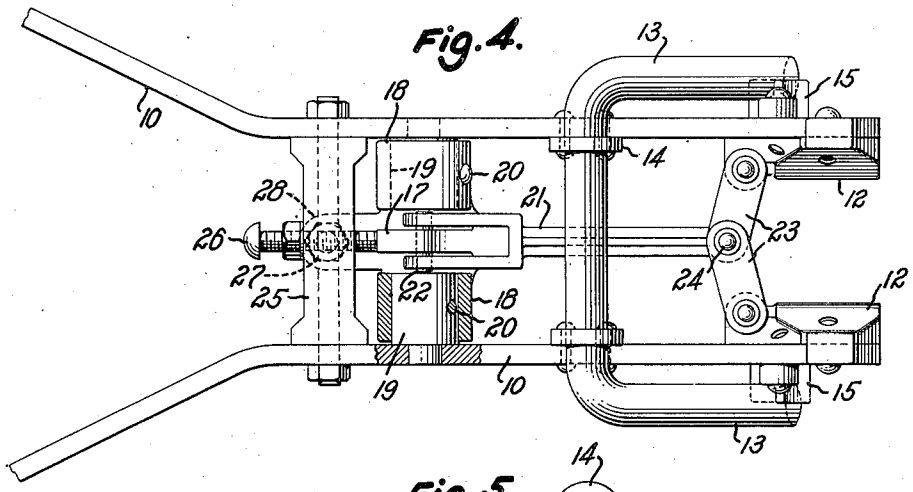


Fig. 5.

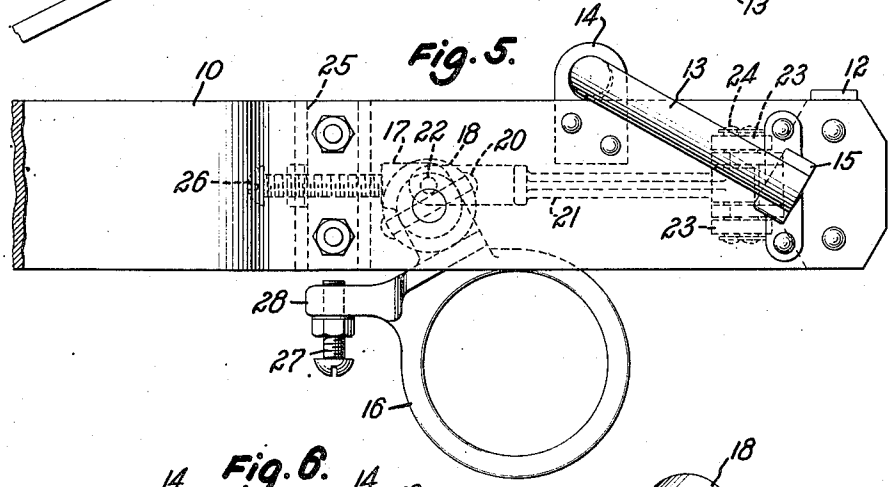


Fig. 6.

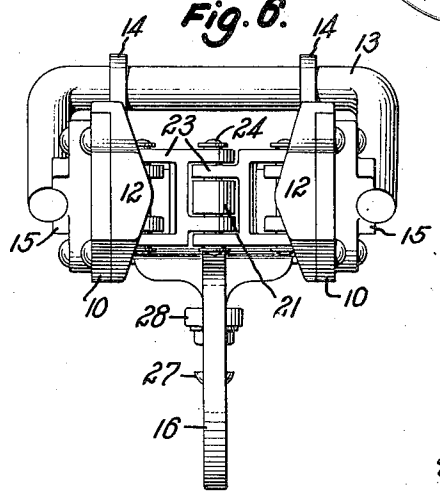
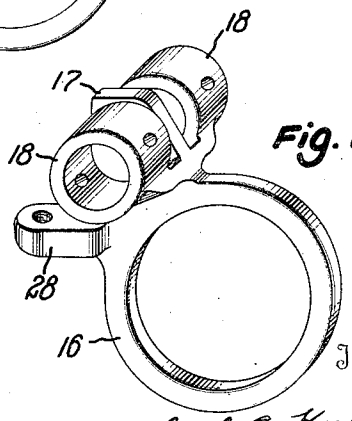


Fig. 7.



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UNITED STATES PATENT OFFICE

2,309,909

ELECTRICAL SWITCH

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Application June 3, 1942, Serial No. 445,598

9 Claims. (Cl. 200—48)

This invention relates to electrical switches and to constructions that are appropriate for use in disconnect switches but that are particularly useful in grounding switches that are closed automatically by heavy springs in a time interval of the order of 8 to 10 cycles on a 60 cycles per second distribution circuit.

The switch blade must be of relatively light weight to permit rapid acceleration when the operating mechanism is tripped, and the kinetic energy of the rapidly moving blade can best be absorbed by contact elements that engage under appreciable pressure to bring the blade to a sliding stop. The opening movement of the blade must rewind the spring of the automatic closing mechanism and must overcome the friction of the blade on the jaw element. These design requirements call for a relatively heavy blade construction which, as previously stated, is not compatible with a rapid acceleration and short closing time. It is not possible to avoid the design requirement that the closing spring be rewound by the opening movement of the switch blade but it is possible to eliminate the frictional resistance of the contact members during the opening of the blade.

An object of this invention is to provide an electrical switch in which the contact elements engage under substantial pressure during a closing movement of the switch, and in which the pressure is relieved during a switch opening operation. An object is to provide a switch including parallel blade contacts that are spring pressed to establish a substantial pressure upon a jaw element during a closing movement of the switch, and switch opening mechanism for relieving the pressure during a switch opening movement.

These and other objects and advantages of the invention will be apparent from the following specification when taken with the accompanying drawings in which:

Fig. 1 is a side elevation of a grounding switch embodying the invention;

Fig. 2 is a bottom elevation of the same;

Fig. 3 is a fragmentary front elevation of the jaw element;

Fig. 4 is a plan view of the contact end of the switch blade;

Fig. 5 is a side elevation, with parts in section, of the same;

Fig. 6 is an end elevation of the blade as seen from the contact end thereof; and

Fig. 7 is a perspective view of the hook ring assembly.

In the drawings, the reference numeral 1 identifies a grounded steel frame or member which supports an insulator column 2 that carries a jaw contact member 3 that is electrically connected to a distribution circuit, and a housing 4 for the spring operating mechanism, not shown, for the switch blade 5. The jaw 3 comprises a casting 6 with an extension 7 to which a line terminal may be clamped and a depending arcuate rib 8 to which a copper contact member 9 is bolted. The copper contact is tapered at its lower end but, throughout the greater part of its length has parallel sides for engagement by the opposed contact blocks of the blade assembly.

The blade assembly comprises straps or blade members 10 that are secured to the shaft 11 of the operating mechanism, contact blocks 12 secured to the outer ends of the straps 10 for engagement with the contact member 9 of the jaw element, a U-shaped spring 13 mounted on straps 10 by ears 14 and bearing upon seats 15 on the outer sides of the straps 10 and in line with the contact blocks 12 to force the strap ends towards each other to establish a substantial pressure of the contact blocks 12 upon the jaw contact 9 during the closing movement of the switch. The contact blocks are of substantially triangular form, as seen in end elevation, to provide approximately line contact engagement, under high pressure, with the jaw contact 9.

The mechanism for opening the switch includes a toggle mechanism that is flattened by the initial pull on a hook ring to relieve the pressure of the contact blocks on the jaw contact. The hook ring assembly constitutes a lever that is pivoted upon the switch blade, the arms of the lever being the hook ring 16 and the rib 17 of a casting that includes bosses 18 at opposite sides of and spaced from the rib 17. The bosses are bored to receive inserts 19 that have reduced diameter outer ends journalled in openings in the straps 10 of the blade, the inserts being secured to the casting by headed rods 20 that extend diametrically through the bosses and inserts. The forked end of a link 21 extends about the rib 17 and is pivoted to the rib 17 by a pin 22. The other end of the link 21 is connected to the toggle members 23 by a pivot pin 24, and the outer ends of the toggle members are pivoted to the inner ends of the contact blocks 12.

The straps 10 of the blade are connected by a rigid spacer bar 25 that is located adjacent the hook ring assembly and limits the spreading of the blade ends to the portions that extend beyond the spacer bar. A stop screw 26 is

threaded through the spacer bar 25 to engage the rib 17 of the hook ring casting and thereby limit the inward movement of the switch blade ends by the spring 13. An adjustable stop to limit the spreading of the blade ends by the toggle mechanism is provided by a screw 27 that is threaded through the extension 26 of the hook ring casting that lies below the spacer bar 25.

Flexible jumpers 29 may extend between a ground bus and the pivot ends of the blade straps 10 to provide a low resistance by-pass around the operating shaft 11.

The switch blade assembly is of relatively light weight and can be closed quickly by the spring mechanism, not shown, and the high speed movement of the blade is gradually slowed down by the friction between the contact blocks 12 of the blade and the contact element 9 of the jaw. This frictional resistance is relatively high as the spring 13 normally establishes a gap, between the contact blocks 12, that is somewhat less than the width of the contact 9 of the jaw. This high frictional resistance is reduced during the opening of the switch as the hook ring assembly rocks on the switch blade to force the link 21 outwardly to flatten the toggle members 23 to spread the ends of the switch blade.

A preferred embodiment of the invention has been illustrated in the drawings but it is to understood that the invention is not limited to automatic grounding switches, and that various changes may be made within the spirit of our invention as set forth in the following claims.

1. In an electrical switch, a jaw element comprising a contact having parallel sides, and a blade assembly pivoted for movement into and out of engagement with said jaw element; said blade assembly comprising a pair of straps having contact blocks at the opposed inner faces of the outer ends thereof, spring means urging said outer ends of the straps towards each other to establish a substantial pressure of said contact blocks upon said contact, a hook ring pivotally supported by said blade straps, toggle members for forcing said contact blocks apart to relieve the pressure thereof on said contact, and a link coupling said toggle members to said hook ring to spread said toggle members when a switch-opening pull is exerted upon said hook ring.

2. In a switch, a blade comprising a pair of straps carrying contact blocks at the opposed faces of the outer ends thereof, a U-shaped spring mounted on said straps to exert pressure upon the outer surfaces thereof in line with said contact blocks to provide a normal separation of said contact blocks less than the width of a jaw contact to be engaged thereby, a hook ring assembly pivotally mounted on said straps for applying thereto a pull to open the switch, and means including a toggle mechanism actuated by said hook ring assembly to spread the outer ends of said blades when a switch-opening pull is applied to said hook ring.

3. In a switch, the invention as recited in claim 2, wherein said contact blocks are of approximately triangular cross-section, as viewed in end elevation, to provide approximately line contact engagement with a jaw contact.

4. In a switch, a blade assembly comprising a pair of straps, contact blocks secured to the inner faces of the outer ends of said straps, spring seats on the outer faces of said straps, a U-shaped spring mounted on said straps with the outer ends thereof bearing on said spring seats, toggle members between said straps with the outer ends pivoted to said straps in approximate alinement with said spring seats, and switch opening mechanism including means for spreading said toggle members to relieve the pressure of said contact blocks on a jaw contact.

5. In a switch, a blade assembly comprising a pair of straps secured to an operating shaft, a rigid spacer bar connecting said straps at a point spaced from the outer ends thereof, means providing contact surfaces at the inner faces of the outer ends of said straps, spring means urging said contact surfaces towards each other, toggle mechanism for spreading apart the outer ends of said straps, and means including a hook ring assembly pivotally supported on said straps between said spacer bar and the outer ends thereof for actuating said toggle mechanism to spread the outer ends of the straps apart upon the application of a switch-opening pull to said hook ring assembly.

6. In a switch, the invention as recited in claim 5, in combination with stop means adjustable to limit the movement of said contact surfaces towards each other by said spring means.

7. In a switch, the invention as recited in claim 5, in combination with stop means adjustable to limit the spreading of the outer ends of said straps by said toggle mechanism.

8. In a switch, the invention as recited in claim 5, in combination with stop means adjustable to limit the said stop means comprising a stop element adjustable on said spacer bar for engaging said hook ring assembly.

9. In a switch, the invention as recited in claim 5, in combination with stop means adjustable to limit the spreading of the outer ends of said straps by said toggle mechanism, said stop means comprising a stop element adjustable on said hook ring assembly for engaging said spacer bar.

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