J. N. MAHONEY.

CIRCUIT INTERRUPTER.

APPLICATION FILED FEB. 16, 1912.

1,132,786.

Patented Mar. 23, 1915.

Fig. 1.

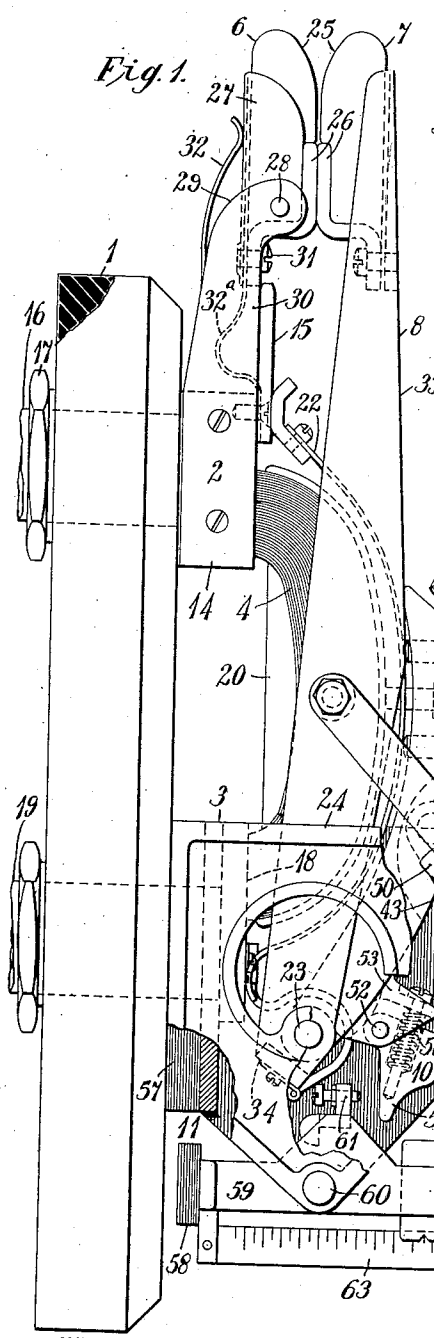


Fig. 3.

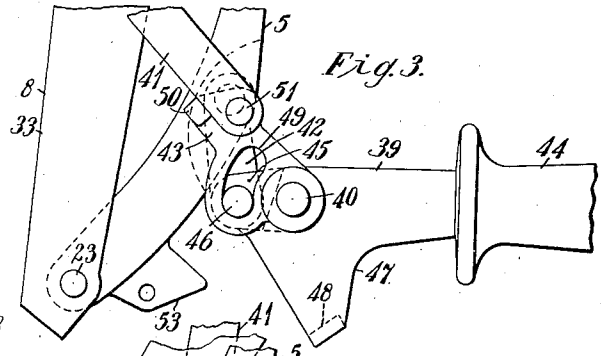


Fig. 4.

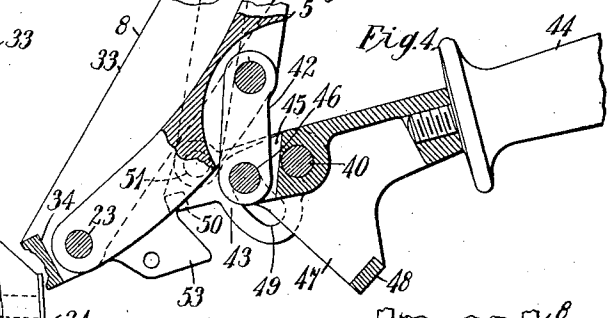
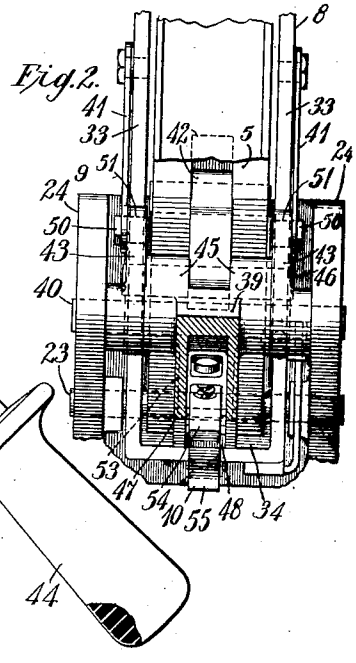


Fig. 2.



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CIRCUIT-INTERRUPTER.

1,132,786. Specification of Letters Patent. Patented Mar. 23, 1915.

Application filed February 16, 1912. Serial No. 678,124.

To all whom it may concern:

Be it known that I, JOSEPH N. MAHONEY, a citizen of the United States, and a resident of Wilkinsburg, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Circuit-Interrupters, of which the following is a specification.

My invention relates to circuit interrupters, and it has special reference to such devices as are provided with auxiliary arcing terminals.

One object of my invention is to simplify and improve the construction and operation of devices of the above-indicated class, and to provide a circuit interrupter which shall be compact, durable and inexpensive in construction, and reliable and effective in operation.

Another object of my invention is to provide a circuit-interrupting device of this general class having a main movable contact member and an auxiliary movable arcing terminal which are independently mounted upon separate supporting arms and which are so interconnected by means of a lost-motion mechanism as to positively insure the separation of the coöperating stationary and movable main contact members and arcing terminals in a predetermined order and a definite time interval apart.

According to my invention, the coöperating arcing terminals are restrained or latched in engagement until the main movable contact member has been withdrawn from its coöperating stationary members a predetermined distance, when the restrained movable arcing terminal is released and a separation of the coöperating arcing terminals is effected, whereby the final arc is confined to, and ruptured by, the terminals intended for that purpose.

In the accompanying drawings, Figure 1 is a view, in side elevation, of a device constructed in accordance with my invention, a portion thereof being broken away for the sake of clearness. Fig. 2 is a view, partially in front elevation and partially in section, of a portion of the operating mechanism shown in Fig. 1, the section being taken along the line 2—2 of Fig. 1. Figs. 3 and 4 are outline views of a portion of the operating mechanism, showing the relative position of the component parts thereof in different stages in the opening operation of the device.

Referring to the drawings, the device shown comprises an insulating panel or slab 1, main stationary contact members 2 and 3, a coöperating movable contact member 4, a supporting arm 5 for said contact member 4, a stationary arcing terminal 6, a coöperating movable arcing terminal 7, a supporting arm 8 for said movable terminal 7, an operating mechanism 9, a latch 10, and a releasing mechanism 11.

The main stationary contact member 2 comprises a contact block 14 and an auxiliary contact plate 15, said contact block constituting the head of a stud 16 that projects through an opening in the insulating panel 1 and is secured thereto by a nut 17. The stud 16 serves as one of the terminals of the device. The stationary contact member 3 comprises a contact block 18 which forms an integral part of a stud 19 that projects through the insulating panel 1 to the other terminal of the device.

The movable contact member 4, which comprises a plurality of strips of conducting material that are held in position between clamping plates 20 and 21, is adapted to coöperate with, and bridge across, the main stationary contact members 2 and 3. An auxiliary conducting member 22 is resiliently associated with the main bridging contact member 4 and is adapted to coöperate with the auxiliary contact plate 15 and the contact member 3. The outer clamping plate 21 constitutes the supporting arm 5 for the movable contact member 4, and its lower end is pivotally supported upon a pin 23 that projects between bracket members 24 which are suitably secured to the insulating panel 1.

The arcing terminals 6 and 7 comprise carbon tips 25 and metal plates 26. The carbon tip 25 of the stationary terminal 6 is securely fastened within a retaining member 27 which is pivotally mounted upon a pin 28 between upwardly projecting arms 29 of a U-shaped supporting member 30, the latter being suitably attached to the contact member 2. The contact plate 26 constitutes the lower portion of the stationary arcing terminal 6 and is secured to the retaining member 27 by screws 31. A spring 32 is provided and rests against the back of the retaining member 27 in such manner as

to maintain the arcing terminal 6 in engagement with its coöperating movable arcing terminal 7. Furthermore, a flexible shunt 32^a is employed to electrically connect the arcing terminal 6 and the main contact member 2.

The movable arcing terminal 7 is similar to the one hereinbefore described and is rigidly mounted at the upper end of the supporting arm 8 which comprises substantially parallel side members 33, the upper ends of which are united to receive the terminal 7 and the lower ends thereof are connected by means of a cross piece 34. The lower ends of the side members 33 are pivotally mounted upon the pin 23, which also serves as a pivotal support for the supporting arm 5, the latter arm being disposed intermediate the side members 3 3 of the supporting arm 8.

The operating mechanism 9 comprises an operating lever 39 that is pivotally mounted upon a pin 40 between bracket members 24, a plurality of links 41 and 42, and a plurality of intermediate members or links 43. The operating lever 39 comprises a handle 44 and upwardly projecting side arms 45 which carry a pin 46, to which the lower end of the link 42 is pivotally connected. The upper end of link 42 is pinned to the supporting arm 5 in a suitable manner and said link 42 is centrally disposed with respect to the operating lever 39 and the supporting arm 5. The operating lever 39 is also provided with downwardly projecting arms 47 that are connected by a cross piece 48 to be engaged by the latch 10. The intermediate members or links 43 are loosely mounted upon the shaft 40 adjacent to the respective bracket members 24 and are of like construction, each embodying a curved slot or opening 49 through which the pin 46 projects and is permitted to travel, and an outwardly projecting lug 50 to engage one of the links 41 when the interrupter is closed, for a purpose to be hereinafter set forth. The outer end of each intermediate member 43 is connected to the lower end of one of the links 41 by a pin 51, while the upper end of each link 41 is pivotally associated with the supporting arm 8 in a well known manner.

The operating lever 39 and the link 42 constitute an operating toggle for actuating the supporting arm 5, while the operating lever 39, the intermediate members 43, and the links 41 constitute an operating toggle for the supporting arm 8, said toggle occupying an approximately dead center position when the interrupter is closed. The relative proportions of the component parts of the operating mechanism are, however, so chosen that, when the interrupter is closed, the operating toggle for the supporting arm 8 is overset slightly beyond its true dead center position, and tends, therefore, to collapse outwardly, while the operating toggle for the supporting arm 5 is slightly underset and, therefore, tends to buckle inwardly. The collapse of the toggle associated with the supporting arm 8, is, however, prevented by reason of the engagement of the lugs 50, forming parts of the intermediate members 43, with the links 41, as will be readily understood, while the engagement of the latch 10 with the cross piece 48 of the operating lever 39 restrains the operating toggle of the supporting arm 5 in its closed position.

The latch 10 is pivotally mounted upon a pin 52 between projecting members 53 which form integral parts of the supporting arm 5 and said latch comprises a catch 54 which is adapted to engage the cross piece 48, as hereinbefore explained, and a downwardly projecting striking member 55. A spring 56 is suitably interposed between the projecting members 53 and latch member 10 for the purpose of maintaining the catch 54 in engagement with the cross piece 48.

The releasing mechanism 11 comprises a stationary magnetizable core 57, a movable coöperating armature 58 and a movable tripping member 59. The stationary core 57 comprises a plurality of U-shaped punchings that surround the stud 19 and are suitably secured to the insulating panel 1. The movable armature 58 is fastened to one end of the tripping member 59 which is pivotally mounted upon pins 60 between the bracket members 24, and is provided with an adjustable trigger member 61 to engage the striking member 55 of the latch 10 in the usual manner. A weight 62, a calibrated scale 63 and an adjusting knob 64 are also associated with the tripping member 59 in order that the latch member 10 may be withdrawn when any desired amount of current traverses the stud 19, said stud constituting the single turn of an exciting winding for the magnetizable core 57.

The operation of the interrupter is as follows: Assuming that the various parts occupy the positions shown in Figs. 1 and 2, and that sufficient current traverses the interrupter to cause the movable armature 58 to be attracted to its stationary core 57, the trigger member 61 delivers a blow to the latch 10, thereby withdrawing the catch 54 from the cross piece 48. Thus, the operating toggle comprising the operating lever 39 and the link 42 is released and said toggle collapses inwardly by reason of the spring action of the main laminated contact member 4 and the weight of the component parts. In so doing, the supporting arm 5 is moved outwardly, thereby allowing the separation of the main movable contact member 4 from the coöperating stationary contact members 2 and 3, and also effecting the disengagement of the auxiliary conducting member 22

and the contact plate 15 subsequent thereto. As the toggle referred to collapses, the operating handle 44 moves upwardly, while the pin 46, associated therewith, is moved downwardly in a counter clockwise direction within the curved slot 49. During this operation, the coöperating arcing terminals 6 and 7 are maintained in engagement, inasmuch as the operating toggle for the supporting arm 8 is restrained in its overset position by reason of the engagement of the projecting lugs 50 with the links 41. This coöperative engagement continues until the main movable contact member 4 has been withdrawn from its coöperative contact members 2 and 3 a predetermined distance, when the operating toggle of the supporting arm 8 is released by reason of the sudden engagement of the pin 46 with the lower ends of the slots 49. The relative positions of the various parts of the operating mechanism, at this instant, are shown in Fig. 3. In this manner, the operating toggle of the supporting arm 8 is brought inwardly across its dead center position, after which the toggle collapses and the supporting arm 8 is moved outwardly to effect the disengagement of the coöperating arcing terminals 6 and 7, it being understood that the final interruption of the circuit takes place between the carbon tips 25 of the arcing terminals by reason of the rocking movement that is imparted to the pivotally mounted arcing terminal 6 by the spring 32.

It should be understood that the proportions and locations of the various parts of the operating mechanism are so chosen that the separation of the main coöperating members 2, 3 and 4, the auxiliary conducting members 22 and 15, the coöperating conducting plates 26, and the coöperating arcing tips 25, takes place in the order named. It will also be understood that, by reason of the lost-motion connection embodying the curved slot 49 and the pin 46 hereinbefore referred to, the movable contact member 4 is separated a predetermined distance from its coöperating contact members 2 and 3 prior to the final interruption of the circuit through the arcing terminals 6 and 7. Thus, a predetermined time element is introduced between the initial and final interruptions of the circuit. Moreover, by reason of the positive connection between the supporting arms 5 and 8, there is no possibility of the various coöperating contact members opening in an improper order.

The relative positions of the various parts of the operating mechanism are shown in Fig. 4 in the full open position of the interrupter.

Assuming the interrupter to be open, and the parts of the operating mechanism to occupy the positions shown in Fig. 4, the closing operation is as follows: The handle 44 is forced downwardly, whereby, the operating toggles hereinbefore mentioned, and the associated supporting arms 5 and 8, are forced into their closed positions. No lost-motion is obtained in the closing operation, as the pin 46 engages the upper end of the curved slot 49 in the open position as shown in Fig. 4. In the closing operation, the coöperating arcing terminals 6 and 7 are first closed, inasmuch as the pivoted terminal 6 is tilted forward by the spring 32, after which the engagement of the auxiliary contact members 22 and 15, and the main contact members 2, 3 and 4 is effected. The movable arm 8 is restrained in its closed position by the projecting lugs 50, and the supporting arm 5 by the catch 54, in the manner hereinbefore explained.

Although I have shown and described my invention as embodying specific structural details and as illustrating a single pole circuit interrupter, it will be understood that it is also applicable to multipolar interrupters. Furthermore, such modifications as may be effected in the arrangement and location of parts without materially changing the operation or the results secured, are to be understood as included within the spirit and scope of my invention.

I claim as my invention:

1. In a circuit interrupter, the combination with a plurality of stationary contact members, a plurality of coöperating movable contact members, and separate supporting arms for said movable members, of separate operating toggles for said arms, a single operating handle for said toggles, means for releasing one of said toggles, and a lost-motion pin and slot connection between said toggles for permitting one of said toggles to remain set while the other is collapsing and for subsequently releasing the same to allow of its collapse.

2. In a circuit interrupter, the combination with a plurality of stationary contact members, a plurality of coöperating movable contact members, and separate supporting arms for said movable members, of an operating handle, an operating toggle between said handle and one of said arms, means for latching said toggle, a plurality of links for associating said handle with the other arm, one of said links having a slot therein, a pin associated rigidly with said handle and projecting into said slot for permitting the collapse of said links subsequent to the release of said latching means.

3. In a circuit interrupter, the combination with a plurality of stationary contact members, a plurality of coöperating movable contact members, separate supporting arms for said movable members, a fulcrum shaft and an operating handle mounted thereon, of a link joining one of said arms

with said handle to form an underset toggle, a plurality of toggles on opposite sides of said handle and said arms and joining said fulcrum shaft with the second arm and embodying links severally pivoted on said shaft and having circular slots therein concentric with said shaft, pins on said handle projecting into coöperative engagement with said slots, and means on said links for oversetting said toggles.

4. In a circuit interrupter, the combination with a plurality of coöperating movable and stationary contact members, two supporting arms for said movable contact members, of separate operating toggles for said arms, a single operating handle for said toggles, and a lost-motion pin and slot connection between said toggles for permitting the toggles to be upset or collapsed at relatively different times.

In testimony whereof, I have hereunto subscribed my name this 13th day of Feb., 1912.

J. N. MAHONEY.

Witnesses:
D. H. MACE,
B. B. HINES.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents. Washington, D. C."