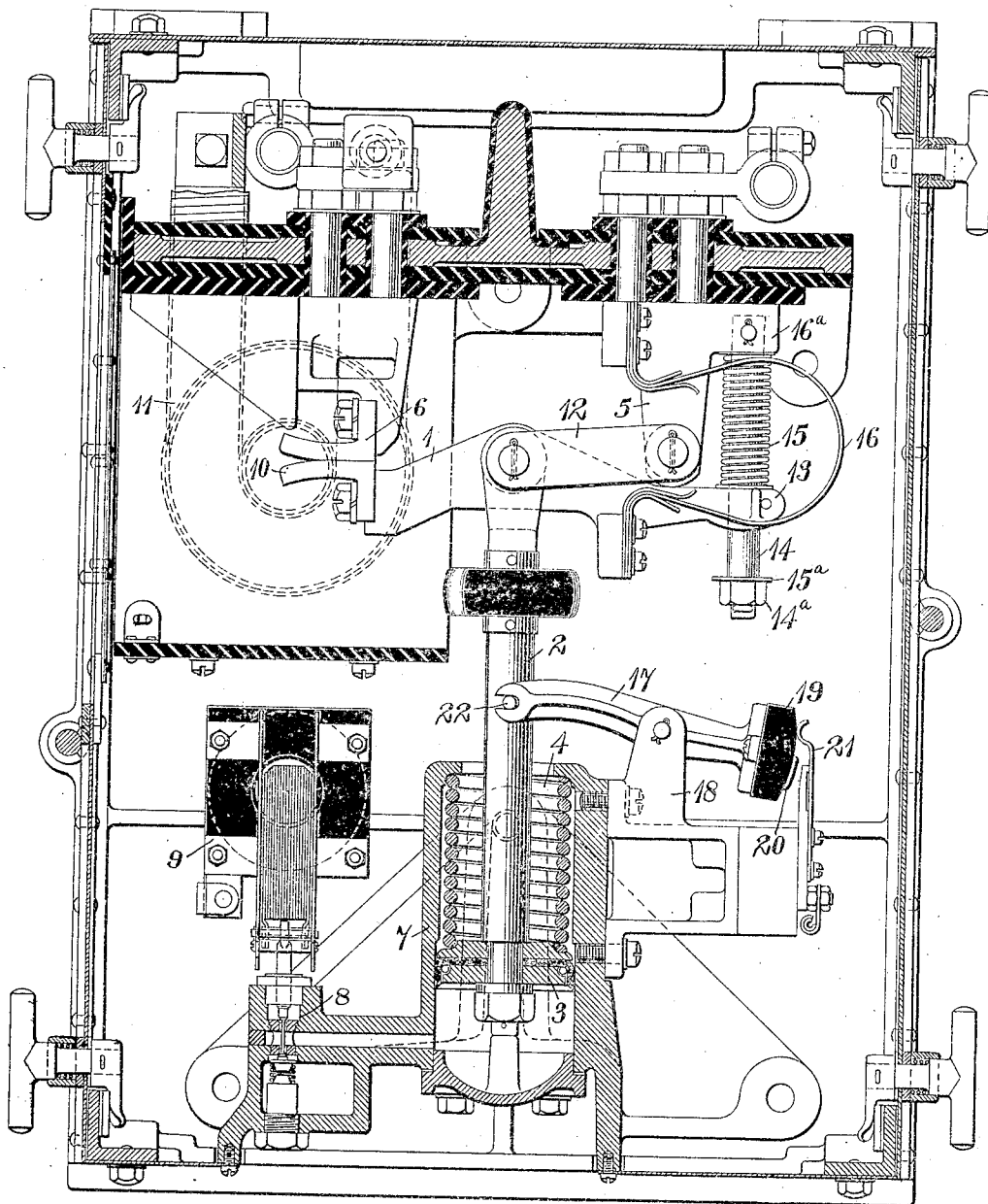


R. P. JACKSON.  
ELECTRIC CIRCUIT INTERRUPTER.  
APPLICATION FILED MAR. 3, 1906. RENEWED JUNE 15, 1911.

1,013,167. Patented Jan. 2, 1912.



WITNESSES:

*Fred H. Miller*  
*R. J. Clearborn*

INVENTOR  
*Ray P. Jackson*  
BY  
*Wesley C. Carr*  
ATTORNEY

# UNITED STATES PATENT OFFICE.

RAY P. JACKSON, OF WILKINSBURG, PENNSYLVANIA, ASSIGNOR TO WESTINGHOUSE  
ELECTRIC & MANUFACTURING COMPANY, A CORPORATION OF PENNSYLVANIA.

## ELECTRIC-CIRCUIT INTERRUPTER.

1,013,167.

Specification of Letters Patent.

Patented Jan. 2, 1912.

Application filed March 3, 1906, Serial No. 304,022. Renewed June 15, 1911. Serial No. 633,350.

*To all whom it may concern:*

Be it known that I, RAY P. JACKSON, a citizen of the United States, and a resident of Wilksburg, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Electric-Circuit Interrupters, of which the following is a specification.

My invention relates to switches or interrupters for electric circuits and has special reference to such switches as are adapted for multiple or sequential operation in the control of electric motors for variable speed service.

The object of my invention is to provide, in an interrupter of the class above specified, improved means for so regulating the operation of the movable contact member that the circuit may always be interrupted at a predetermined point, and to reduce to a minimum the resistance of the circuit through the contacts when the switch is closed.

Electric vehicle motors of relatively large size and capacity are often controlled by groups of electro-pneumatically or electromagnetically operated switches and as these switches effect the complete control of the motor circuits, they are necessarily subjected to particularly severe service. Therefore it is specially desirable to provide an excellent contact between the movable and stationary members of the switch and to prevent the maintenance of arcs at the points where the circuits are interrupted in order to prolong the life and increase the efficiency of the control apparatus. In the prior art, a contact arm has usually been hinge-connected to a stationary terminal, and operated by a reciprocating rod which moved it into and out of engagement with a suitable stationary contact terminal. In order to prevent injuries to the contact surfaces by the arcs which take place when the circuit is interrupted, the contact end of the hinged arm has often been yieldingly supported so that, as the arm was moved away, the contact terminal itself was given a rolling motion, thereby causing the arcs to form between surfaces which were separated when the switch was closed. With this construction, although a good connection could be maintained between the movable contact member and the corresponding stationary contact member, the resistance of the circuit

through the contact arm was materially increased by reason of the yieldable connection between the arm and its contact terminal and by reason of the hinge connection between the arm and the stationary terminal to which it was attached.

By my present invention I retain all the desirable features of the prior art and materially reduce the resistance through the contact members by converting the arm into a bridging contact member which is normally held in engagement with two stationary contact terminals by relatively high pressure, thereby establishing a direct connection through the contact arm when the switch is closed. In order to so open the circuit as to prevent injury to the contact surfaces, I connect a flexible shunt between one of the stationary contact members and one end of the bridging arm, which carries the current temporarily during the opening and closing of the switch.

The single figure of the accompanying drawing is a sectional elevation through a single switch constructed in accordance with my invention.

Although I have shown a pneumatically-operated circuit interrupter, my invention is not confined thereto since any convenient means may be employed for operating the movable member.

Referring to the drawing, a bridging contact arm 1 is pivotally mounted, near its central point, upon one extremity of an actuating rod 2, the other extremity of which is connected to a pneumatically-operated piston 3 that acts in opposition to a spring 4 and moves the arm 1 into and out of engagement with a stationary contact member 5. The piston 3 operates within a cylinder 7 which is supplied with fluid-pressure through a valve 8 that is governed by an electromagnet 9. A terminal member 10 is attached to one end of the contact arm 1 and engages a stationary terminal 6 when the switch is closed, the extremities of these terminal members 10 and 6 being located in the air-gap of a magnetic circuit which is produced by a magnetizing coil 11 and which serves to extinguish any arcs which may occur at this point. The upper extremity of the rod 2 is connected to the stationary terminal 5 by means of a link 12. The extremity 13 of the arm 1 which projects beyond the terminal 5, is bifurcated to engage

a rod 14 having a nut 14<sup>a</sup> and a washer 15<sup>a</sup> to limit the motion of this extremity of the arm in one direction. The rod 14 serves also as a guide for a spring 15 that is interposed  
 5 between the fork 13 and a projection 16<sup>a</sup> on the stationary terminal 5. The link 12, and a flexible conductor 16, constitute shunt paths for the current during the opening and closing of the switch, while the arm itself is  
 10 held firmly in engagement with the stationary terminal 5 when the switch is in its closed position.

The limiting rod 14 is so arranged, in combination with the spring 15, that, as the  
 15 switch is closed, the outer extremity of the terminal 10 is first moved into engagement with the outer end of the stationary terminal 6, whereupon circuit is completed from the terminal 5 through the link 12 and the  
 20 conductor 16, the arm 1 and the terminal 10 to the terminal 6, since the spring 15 holds the projection 13 of the arm 1 in its extreme position of separation. As the rod 2 acts still further, the spring 15 is compressed  
 25 and the arm 1 is moved into direct engagement with the stationary terminal 5 and the normal contact surface of the terminal 10 is moved into engagement with the corresponding surface of the terminal 6 so that  
 30 circuit is thereafter completed from terminal 5 directly through the arm 1 and the terminal 10 to the stationary terminal 6. When the air pressure is exhausted from the cylinder 7, the spring 4 opens the switch  
 35 and the same steps are passed through in opening as in closing, except that they are accomplished in the reverse order, so that the terminal 10 is held in engagement with the stationary terminal 6 until the opposite  
 40 extremity of the arm 1 is disengaged from the terminal 5 and the projection 13 has reached the limit of its separation as determined by the washer 15<sup>a</sup>, the circuit being finally broken at the outer extremities of the  
 45 terminals 6 and 10, which, as hereinbefore explained, are provided with suitable means for extinguishing the arc. In this way, the normal contact surfaces of the terminals 10 and 6 are preserved from the injuries which  
 50 would otherwise occur by reason of the arcs.

A relay switch for governing the control circuits comprises an arm 17 pivotally supported upon a bracket 18, and having at one end an insulating block 19 provided  
 55 with contact segments 20, that are engaged by a plurality of contact fingers 21. The opposite extremity of the arm 17 is slotted and engages a pin 22 that projects from the rod 2. In this way, the motion of the rod  
 60 is transmitted to insulating block 19 through the rocking arm 17.

The electro-magnet 9, as shown, is constructed in accordance with a design described in my co-pending application Serial  
 65 No. 253,638, filed April 3, 1905, and patent-

ed April 30, 1907, 851,663, but may, of course, be of any suitable construction.

I claim as my invention:

1. In an electric circuit interrupter, the combination with an actuating rod, a movable bridging contact member pivotally mounted near its central point upon the said rod, a pair of stationary contact members to be engaged by said movable member, a link and a flexible shunt between one of the stationary members and the movable member, of means for effecting final engagement of the movable member with one of said stationary members as the switch is closed and for effecting initial separation of said members as the switch is opened, said means comprising a spring and a stationary guide rod therefor having a stop at its free end.

2. The combination with an actuating rod, a movable bridging contact member pivotally mounted thereon, and a pair of stationary contact members to be engaged by said movable member, of a link and a flexible shunt between one of the stationary members and the movable member, and means for effecting final engagement of the movable member with said stationary member as the switch is closed.

3. The combination with an actuating rod, and a movable bridging contact member pivotally mounted near its central point upon said rod, of a pair of stationary contact members to be engaged by said movable member, a link and a flexible shunt between one of the stationary members and the movable member, and means for effecting final engagement and initial separation of the movable member and said stationary member, said means comprising a spring which tends to separate the movable member from the shunted stationary member.

4. In an electric circuit interrupter, the combination with an actuating rod, a movable bridging contact member pivotally mounted thereon, a pair of stationary contact members engaged by said movable member and a link and a flexible shunt between one of the stationary members and the movable member, of means for effecting final engagement and initial separation of the movable member and said stationary member, said means comprising a spring which tends to separate the movable member from the shunted stationary member and a stationary guide rod having means for limiting the motion of one extremity of the movable member.

5. The combination with a movable bridging contact member, an actuating device upon which said member is pivotally supported at a point between its contact portions and a pair of stationary contact terminals, of a spring acting against one end only of the movable member to turn it upon its pivot away from the corresponding sta-

tionary contact terminal in order to insure final engagement and initial separation of said parts.

6. In an electric circuit interrupter, the combination with a bridging contact member, an operating member upon which said bridging member is pivotally supported between its contact portions, and a pair of stationary contact terminals to be engaged by said bridging member, of a repelling spring interposed between one end of the bridging member and a stationary part in order to insure a final engagement and an initial separation of said end and the corresponding stationary contact terminal.

7. In an electric circuit interrupter, the combination with a bridging contact member, an operating member upon which said bridging member is pivotally mounted between its contact portions, and a pair of stationary contact members to be engaged by said bridging member, of means for effecting final engagement and initial separation of the bridging member and one of said stationary contact members, said means comprising a spring which tends to separate the bridging member from said stationary member and a stationary guide rod therefor which limits the motion of one extremity of the bridging member.

8. In an electric circuit interrupter, the combination with a pivotally mounted movable bridging contact member and a pair of stationary contact members to be engaged by said movable member, of means for effecting final engagement and initial separation of the movable member and one of said stationary members, said means comprising a spring which tends to separate the movable member from the said stationary member and a stationary guide rod therefor which limits the motion of one extremity of the movable member and supports the spring between said extremity and a suitable projection on said stationary contact member.

9. In an electric switch, the combination with a pair of stationary contact terminals, of a bridging contact member, a supporting and actuating device upon which said bridging member is pivotally mounted between its contact portions, and a spring interposed

between one end of the bridging member and the corresponding contact terminal to turn said member upon its pivot and move said end away from said contact terminal.

10. In an electric switch, the combination with a pair of stationary contact terminals, of a bridging contact bar, a supporting and actuating rod upon which said bar is pivotally mounted between its contact portions, a flexible shunt around one of the stationary contact terminals and a spring constantly tending to separate one end of the bridging bar from the shunted terminal.

11. In an electric switch, the combination with a pair of stationary contact terminals, a bridging contact bar, and a supporting and actuating rod upon which said bar is pivotally mounted between its contact portions, of a flexible shunt around one of said contact terminals, a spring tending to separate one end of the bridging bar from the shunted terminal and a stop for limiting the degree of such separation.

12. In an electric switch, the combination with a pair of stationary contact terminals, a bridging contact bar, a rod upon which said bar is pivoted between its contact portions, and means for actuating said rod to make and break the circuit, of a flexible shunt around one of said terminals, a spring tending to separate one end of said bar from the shunted terminal and a stop for limiting the movement of separation.

13. The combination with a movable contact member, a stationary contact terminal opposite one end of said movable contact member and a stop opposite the other end, an actuating device upon which said member is pivotally supported at a point between its ends, and a spring acting against one end only of the movable member to turn it upon its pivot away from the stop in order to insure final engagement and initial separation of the movable member and the stop.

In testimony whereof, I have hereunto subscribed my name this 24th day of February, 1906.

RAY P. JACKSON.

Witnesses:

R. B. INGRAM,  
BIRNEY HINES.