July 16, 1940. L. PIERCE 2,208,387

SWITCHING DEVICE

Original Filed July 26, 1935

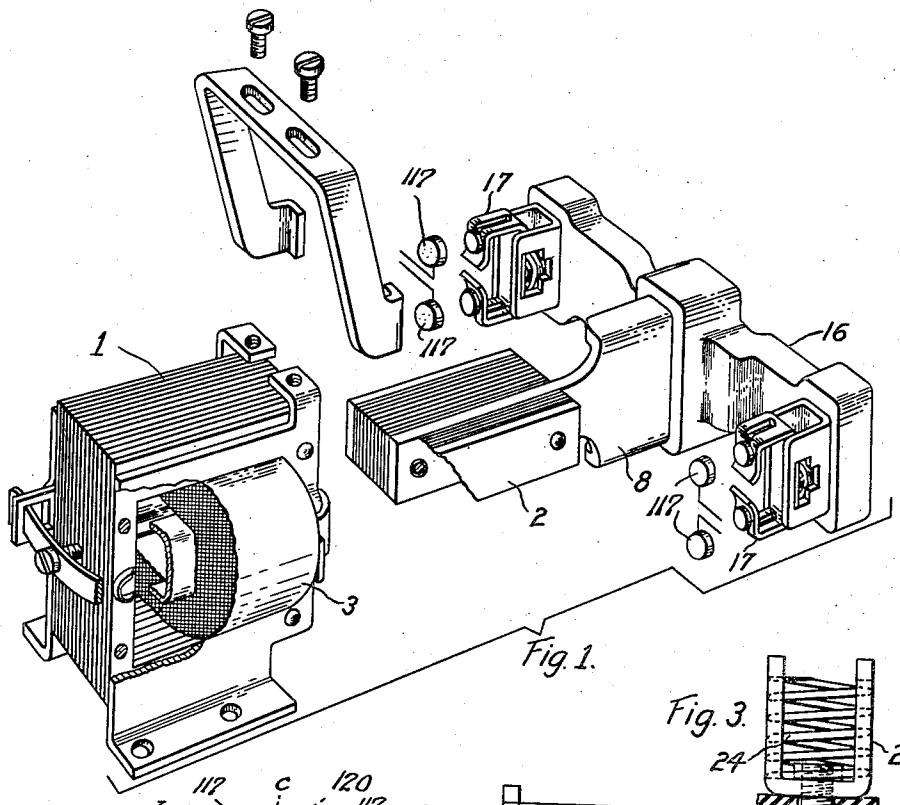


Fig. 1.

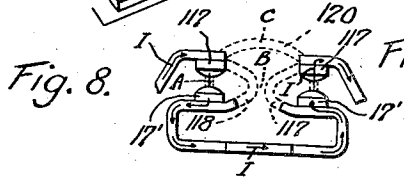


Fig. 8.

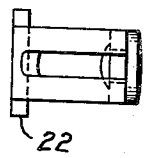


Fig. 2.

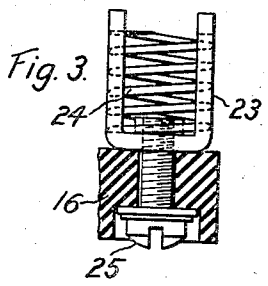


Fig. 3.

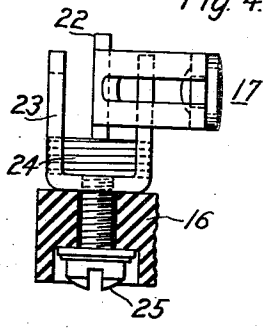


Fig. 4.

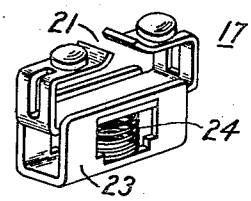


Fig. 6.

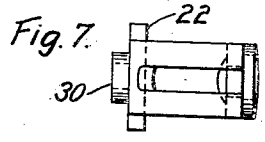


Fig. 7.

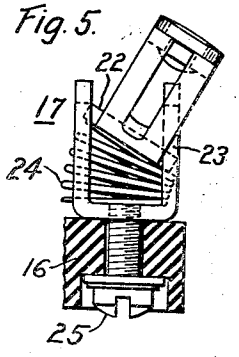


Fig. 5.

WITNESSES:

Wm. B. Sellers.

Mrs. C. Groome

INVENTOR

Lawrence Pierce.

BY

Paul E. Friedemann

ATTORNEY

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2,208,387

UNITED STATES PATENT OFFICE

2,208,387

SWITCHING DEVICE

Lawrence Pierce, Pittsburgh, Pa., assignor to Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., a corporation of Pennsylvania

Original application July 26, 1935, Serial No. 33,297. Divided and this application April 2, 1937, Serial No. 134,556

14 Claims. (Cl. 200—166)

My invention relates, generally, to switching devices.

One object of my invention is the provision of simple demountable contact members to be used in connection with circuit closing, or circuit interrupting, devices.

Other objects and advantages of my invention will become more apparent from a study of the following specification when considered in conjunction with the accompanying drawing, in which:

Figure 1 is a perspective exploded view showing the arrangement of the parts of an electromagnetically operable switch, or circuit interrupter, embodying the features of my invention;

Fig. 2 is an end view of a pair of contact members such as may be used with the circuit interrupter shown in Fig. 1, illustrating my invention;

Fig. 3 is an end view of the mounting means for the construction of the contact members shown in Figs. 1, 2, 4, 5, 6 and 7;

Figs. 4 and 5 illustrate two steps showing how the mounting means, shown in Fig. 3, and the contact members, shown in Fig. 2, are brought into normal or working position;

Fig. 6 shows perspectively the relation of a pair of contact members and the mounting means therefor;

Fig. 7 is a showing similar to Fig. 2 and illustrates a modified construction of the contact members; and

Fig. 8 shows how the shape of the current-carrying member or contact member aids in blowing out the arc that ordinarily forms when a circuit is interrupted.

This application is a division of my application entitled Electromagnetic devices, filed July 26, 1935, Serial No. 33,297.

Referring more particularly to Fig. 1 of the drawing, 1 designates the magnetic frame or field piece, 2 the movable magnetic plunger, and 3 the magnetizing winding or coil of an electromagnet for actuating the plunger.

The plunger 2 has an extension 8 extended as shown in Fig. 1 to receive a contact carrying cross bar 16. This cross bar 16 is firmly secured to the extension 8 and carries a plurality of generally C-shaped contact bridging members 17, presently to be described.

The electromagnet for operating the plunger 2 merely illustrates one means for operating the contact bridging member 17. It is, of course, clear that cross bar 16 and thus member 17, may be operated in any other manner without departing from the spirit of my invention.

The contact bridging members I have devised are extremely simple, inexpensive, may be readily mounted on their support, and by their construction help to extinguish the arc that usually is present when a circuit is opened. As shown in Figs. 2 to 8 inclusive, the whole structure comprises but four pieces. The contact bridging member 17 comprises a generally loop-like or C-shaped structure, as best shown in Figs. 1, 6 and 8, open at point 21. At the bight or base portion of the loop the material presents an enlarged rectangular region 22.

The retaining means or mounting means for the loop comprises a U-shaped member 23 having side windows cut out as shown in Figs. 1 and 6. A helical spring 24 of sufficient diameter to be held in place by the upper edge of the side windows is disposed between the sides of the U-shaped member 23. A bolt 25 or rivet is adapted to hold the U-shaped retaining member in place on the insulation of the switch, namely, the cross bar 16.

In mounting the elements 17, shown in Figs. 2, 3 and 8, they are successively brought into the relation shown in Figs. 4, 5 and 6, respectively.

In Fig. 7 it will be noted that the lower or bight portion of the loop-like structure is provided with a cylindrical projection 30. One of the purposes of this projection is to hold the spring 24 in place on the loop-like structure. The showing in Fig. 7, is, however, not a preferred modification and the need for the additional cylindrical lug arises only when, for some reason, a spring is selected that fits rather loosely into the U-shaped member 23.

To more clearly bring out how the construction of the contact members helps to extinguish the arc that usually is present when a circuit is interrupted, reference should be had to Fig. 8. During the interruption of the current between the terminals 17' and 117 the magnetic fields of the current in the loop and in the arc are in such relation to each other that the arc gets blown up, or away, from the opening 21. The result is that the arc is transferred to terminals 117. The advantage is that the arc is automatically made longer; is changed from two short arcs to a single long arc; is moved away from the contact region and thus does not burn the terminal surfaces; and the arc is moved to a region where an arc extinguisher, as an arc chute working on the de-ion principle, may be readily positioned.

The reference characters 117, 118, and 120

show how the arc travels. The magnetic effect of the construction of the contact bridging member 17 is to move the arcs 117 and 118 from position A, where they are initially established, to position B where the two arcs merge and form the single arc 120 which moves up to position C. The length of the arc 120 thus becomes greater and greater and is thus readily extinguished.

In practice I position deionizing plates, not shown and not in themselves part of my invention, in the region designated as position C. These plates attract the arc and aid its upward movement to the final C position. My invention is, however, complete and effective without the use of the deionizing plates.

While the foregoing discloses an embodiment and a modification of contact bridging members in combination with electromagnetic actuating means, I do not wish to be limited to the specific details shown and described. Clearly, the contact bridging members I have shown more specifically in Figs. 2, 3, 4, 5, 6, 7 and 8 need not necessarily be actuated by electromagnetic actuating means, but are equally useful in connection with manually or pneumatically operated means for closing or interrupting electric circuits. I wish to be limited only by the scope of the appended claims and the pertinent prior art.

I claim as my invention:

1. In an electric switch, in combination, spaced stationary contacts, a U-shaped contact bar for electrically bridging the same, a U-shaped member between the legs of which U-shaped member the bar is slidably mounted but constrained, said member having stops on the legs of the U to constrain the bar in its outward movement but to provide a universal movement of the bar on the member, resilient means bearing against the back of the bar adapted to bias the bar against the stops on the member but not interfering with universal movement of the bar with reference to the member, and means for actuating the member.

2. In a switch, in combination, a U-shaped contact carrying member having legs that are wider than long, side windows in the legs of the U each having a given width for a portion of their lengths and a lesser width for the remaining portion of their length, a helical spring, having a diameter nearly equal to the width of the wider portion of the side-windows and nearly equal to the overall width of the contact carrying member, disposed between the legs of the U and held in place by the ends of the legs of the U and the sides of the narrower portion of the side-windows, a substantially rectangular type C, C-shaped members having rectangular enlargements at the back of the C fitting into the wider portion of the side-windows, said C-shaped member having a width at the rectangular enlargement nearly equal to the overall width of the U-shaped member but otherwise having a width a little less than the distance between adjacent surfaces of the legs of the U, said spring being positioned between the inside of the bight of the U and the outer or back portion of the C at the enlargement to thus firmly yet resiliently hold the C-shaped member in a given position at the ends of the legs of the U-shaped member, contact terminals mounted on the end portions of the C-shaped member, and a pair of stationary contact terminals disposed to be engaged by the contact terminals on the C-shaped member upon actuation of the U-shaped member.

3. In an electric switch, in combination, a pair of spaced stationary contacts, a C-shaped member, having contact terminals at the ends adjacent the open portion of the C-shaped member, adapted to bridge the stationary contacts, a mounting on which the member is slidably mounted, a spring to yieldingly urge the contact bar in one direction on the mounting, and means on said mounting adapted to allow universal rocking movement of the member with reference to the mounting.

4. In an electric switch, in combination, two spaced stationary contact terminals, a C-shaped member, having mounted thereon contact terminals at the ends adjacent the open portion of the C-shaped member, adapted to bridge the stationary contact terminals, a pair of spaced mounting bars between which the C-shaped member is slidably mounted, a spring disposed between the bars and pressing against the C-shaped member to yieldingly urge the same outwardly on the bars, and means on the bars adapted to retain the spring in position but without interfering with a universal movement of the C-shaped bar.

5. In an electric switch, in combination, spaced stationary contacts, a contact bar generally the shape of a C adapted to engage the stationary contacts at the ends of the said C, a support on which the said bar is slidably and tiltably mounted, said support having a stop to limit the movement of the bar toward the contacts, resilient means bearing against the outer portion of the bight of the C of the bar adapted to bias the bar against the stop on the post but not interfering with universal movement of the bar with reference to the support, and means for actuating the support.

6. In an electric switch, in combination, a pair of spaced stationary terminals having contact surfaces and which terminals if bridged, complete an electric circuit, a terminal bridging member having contact surfaces, said terminal bridging member having generally the shape of a C with the contact surfaces of the terminal bridging member disposed at the ends of the C which ends are so spaced that the contact surfaces on the stationary member may be engaged by the contact surfaces of the terminal bridging member, means for moving the terminal bridging member to interrupt the electric circuit whereby the shape of the terminal bridging member causes the two arcs formed at the contact surfaces to move away from the contact surfaces of both the terminals and the bridging member, and to move so as to play between the stationary terminals only.

7. In a circuit interrupter, in combination, a pair of spaced stationary terminals having contact surfaces, a generally C-shaped terminal bridging member having contact surfaces for engaging the contact surfaces of the terminals, a pair of substantially parallelly disposed plates having guides extending over a portion of the width of the plates, said C-shaped member being designed at the bight portion of the C to engage said guides, resilient means disposed to bias the member in the guides to an end position of the guides toward the terminals whereby all the contact surfaces are engaged with a substantially predetermined pressure, means for moving the plates away from the terminals to thus interrupt engagement of the contact surfaces.

8. In a switch having a pair of stationary terminals, in combination with a movable terminal bridging member, said movable member being

generally C-shaped so that upon opening of the switch the magnetic field produced by the C-shaped terminal bridging member will lengthen the arcs at each end of the C and move the arcs so that they merge into one arc between the stationary terminals.

9. In an electric motor, in combination, two spaced stationary contacts, a C-shaped contact bridging member, a pair of spaced supports on which the member is slidably mounted, a spring disposed between the supports and pressing against the outer portion of the bight of the C-shaped member to thus yieldingly urge the same outwardly on the supports, and means on the supports adapted to retain the spring in position but without interfering with the rocking movement of the member.

10. In an electric switch, in combination, a pair of spaced stationary contacts, a C-shaped member, havng contact surfaces at the ends of the C, adapted to bridge the stationary contacts, a support upon which the C-shaped member is slidably mounted, a spring loosely held by the support, adapted to bias the C-shaped member in one direction on the support, and means for moving the C-shaped member away from said stationary contacts.

11. In a switch, in combination, a pair of terminals, a bridging member having a pair of contacts for engaging the terminals, a U-shaped member for carrying the said pair of contacts, said U-shaped member having legs that are wider than long, guides in the legs of lesser length than the legs and ending short of the ends of the U, a spring held between the legs of the U by the guides, a C-shaped member having enlargements at the back of the C fitting into the guides, said spring being positioned between the inside of the bight of the U and the outer or back portion of the C at the enlargement to thus firmly yet resiliently hold the C-shaped member in a given position at the ends of the guides in the legs of the U-shaped member, said pair of contacts for engaging the terminals mounted on the end portions of the C-shaped member, and means for moving the U-shaped member to interrupt the engagement of the said contacts with the said pair of stationary terminals.

12. In a circuit interrupter, a movable switch element having two contacts adapted to engage two terminals, said movable switch element being substantially the shape of a rectangular type C with the contacts at the ends of the C and the bight portion of the C extending away from the terminals, whereby interruption of a circuit will cause the two arcs formed at the terminals and contacts to lengthen and merge into one arc between the terminals.

13. The sub-combination for a switch, comprising a C-shaped contact bridging member having contact engaging surfaces at the ends of the C, and terminals so disposed with reference to the contact engaging surfaces that, during interruption of a circuit, the magnetic effect of the arcs and the currents in the contact bridging member and the terminals is such as to lengthen the arcs and transfer them to the terminals.

14. The sub-combination for a switch, comprising a C-shaped contact bridging member having contact engaging surfaces at the ends of the C, whereby during interruption of a circuit the magnetic fields of the arc and the magnetic field of the current in the C-shaped contact bridging member are at right angles to each other.

LAWRENCE PIERCE.