Aug. 15, 1944. D. ELLIS ET AL 2,356,040

ARC CONTROL DEVICE

Filed July 31, 1942

Fig. 1.

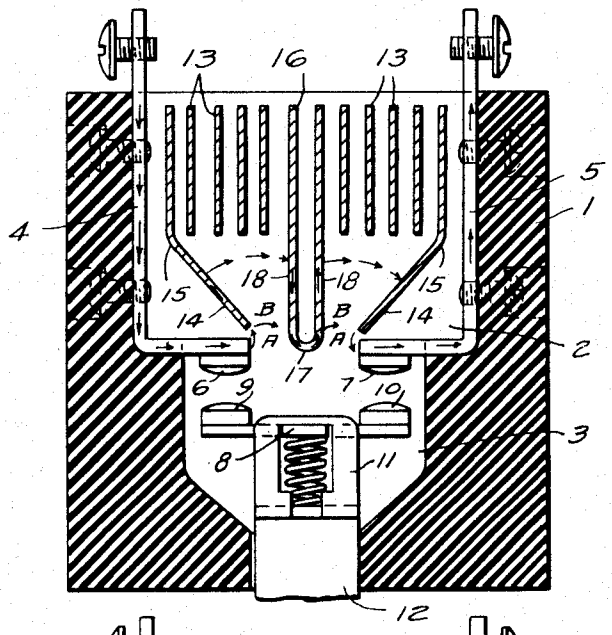


Fig. 2.

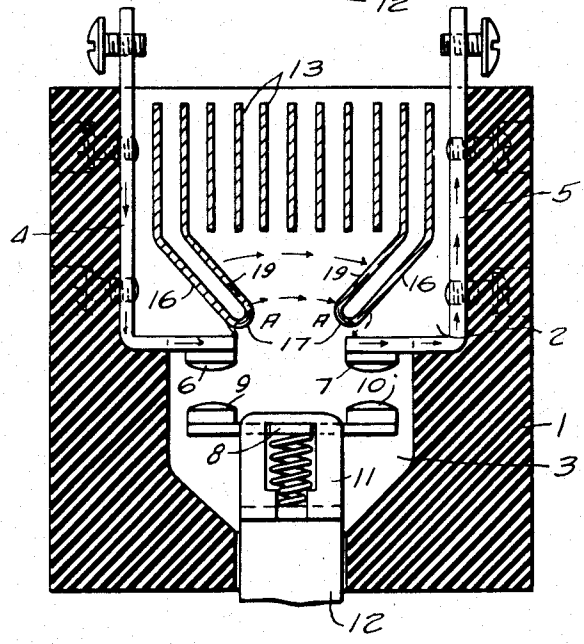
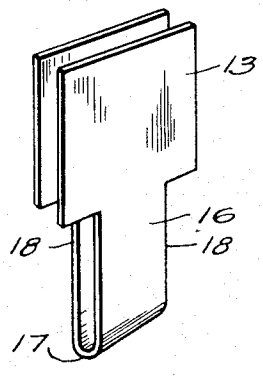


Fig. 3.



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ARC CONTROL DEVICE

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5 Claims. (Cl. 200—147)

This invention relates to an arc limiting device and, more particularly, to improved structure for moving an arc drawn between two contact members into deionizing grids where it may be extinguished.

The manner in which deionizing grids function to break up and extinguish an arc drawn between two contacts is well known. Patent No. 1,932,090, issued October 24, 1933, to Joseph Slepian may be referred to as an example of an arc extinguishing structure employing deionizing grids and for the theory of operation of such grids. In the use of such grids for extinguishing an arc, it is necessary to provide a means for moving the arc with sufficient rapidity to and into the grids before damage has been done to the contacts, and before an amount of ionized gas sufficient to cause failure in another part of the switch, or sufficient to interfere with the function of the grids, has been evolved.

Various arrangements have been employed for the purpose of moving the arc away from the contacts and into the grids where it may be extinguished. Obviously, a magnetic blow out coil and like conventional devices for moving an arc may be employed for this purpose. However, the elimination of such devices wherever possible is desirable for the reason that they are expensive to manufacture and occupy an unreasonably large amount of space.

One of the principal objects of this invention is to provide an improved arrangement of structure for moving an arc toward and into deionizing grids which will be inexpensive to manufacture and will occupy a minimum of space.

A further object is to provide a device which will distort the path of an arc drawn between two contact members and thereby produce a magnetic field for moving the arc toward and into the grids.

Other objects and advantages of this invention will become apparent from the following description and the accompanying drawing in which:

Figure 1 is a vertical sectional view of a circuit interrupting device constructed in accordance with the principles of this invention;

Fig. 2 is a view similar to Fig. 1 illustrating a modification; and

Fig. 3 is a perspective view of the U-shaped metallic arc control device shown in Fig. 1.

In the drawing numeral 1 designates a housing formed of insulating material having a cavity 2 and an opening 3 formed therein and communicating with such cavity. Conducting members 4 and 5 are mounted in the housing 1 and are respectively provided with stationary contacts 6 and 7 at the upper portion of the opening 3 adjacent the cavity 2. A bridging member 8 having a pair of movable contacts 9 and 10 respectively engageable with the stationary contacts 6 and 7 is mounted on a saddle 11 connected to an operating member 12 for moving the contacts 9 and 10 back and forth in the opening 3 between positions engaging and disengaging the contacts.

A plurality of deionizing grids 13 are mounted in position in the cavity 2 for extinguishing an arc drawn between the contacts 6 and 7. The above mentioned patent to Slepian may be referred to for an understanding of the construction and theory of operation of the grids 13.

In the showing of Fig. 1 the two end grids 13 are provided with extensions or arc horns 14 which extend angularly and downwardly from the front edges 15 of the grids to points adjacent the stationary contacts 6 and 7. A U-shaped member 16, best shown in Fig. 3, is mounted transversely of the cavity 2 with its closed end 17 positioned substantially centrally of and between the stationary contacts 6 and 7. The parallel sides or limbs 18 of the U-shaped member 16 at the open end thereof provide the two central grids shown in Fig. 1. That is, these links 16 are coextensive with the grid plates 13 and lie in parallel thereto so as to form part of the grid plate arrangement.

Upon operation of the member 12 to disengage the movable contacts 9 and 10 from the stationary contacts 6 and 7, an arc will be drawn which will join across the contacts 6 and 7 when the resistance of the path across the contacts 6 and 7 is less than the resistance of the path from the contact 6 to the contact 9 and through bridging member 8 and contact 10 to the contact 7. At the time the current path is completed directly from the stationary contact 6 to the stationary contact 7 arcs will strike between the lower ends of the members 14 and the contacts 6 and 7 and between the members 14 and the outer surfaces of the parallel sides 18 at the closed end 17. The current path at such time will be as indicated by the lower set of arrows as shown in Fig. 1. Attention is invited to the fact that the arcs striking to the closed end 17 splits the arc intermediate the contacts 6 and 7 into two portions, which are electrically connected by the current flowing through the semicircular portion of the closed end 17. The current flowing through such semi-circular portion forms current

loops, provides strong magnetic fields at the points A and weaker magnetic fields at the points B which are effective to drive the separate arc portions upwardly along the facing surfaces of the members 14 and 18. As the arcs are driven upwardly, along the continuous surfaces of the links 16 and the outer grid plates 15 the current will follow the path as indicated by the upper set of arrows and the arcs will be driven into the grids 13 where they will be extinguished.

The structure illustrated in Fig. 2 is similar to that shown in Fig. 1 and like numerals have been employed to designate like parts. In this showing two U-shaped members 16 are employed and have their closed ends 17 respectively positioned adjacent the stationary contacts 6 and 7. In this construction a single arc will strike between the closed ends 17 and the current flowing in such closed ends will form partial loops, thereby creating strong fields at the points A which will be effective to drive the ends of the arc upwardly along the continuous surfaces 19 and into the grids 13.

In both modifications the shape of the closed ends 17 and the manner in which the current flows therethrough is effective to distort the path of the current flowing between the stationary contacts. In this manner, magnetic fields for driving the arc are provided by causing the current to flow in a partial loop, a current flowing in a loop or partial loop having a strong magnetic field at its center and a weaker field on its outside.

From the foregoing, it will be apparent that the U-shaped members 16 and the manner in which they are employed to distort the path of an arc drawn between the contacts 6 and 7 are effective to provide a magnetic field for driving the arc into deionizing grids. It will also be apparent that the structure providing such field is inexpensive to manufacture and install and requires a minimum of space.

Since numerous changes may be made in the above described construction and different embodiments of the invention may be made without departing from the spirit and scope thereof, it is intended that all the matter contained in the foregoing description or shown in the accompanying drawing shall be interpreted as illustrative and not in a limiting sense.

We claim as our invention:

1. In a circuit breaker having contacts for drawing an arc, and an arc quenching means, said means comprising a set of grid plates disposed substantially in parallel and in spaced relation to each other and extending substantially at right angles to the arc to be quenched, and a substantially U-shaped arcing member having a loop portion integral with two limb portions, said loop portion projecting over said set toward said contacts to form an arcing horn and said limb portions extending continuously from said loop portion into said set in parallel and in spaced relation to said plates.

2. In a circuit breaker having contacts for drawing an arc, and arc quenching means, said means comprising, in combination, a set of individual grid plates of flat shape disposed substantially in parallel and in spaced relation to each other and extending substantially at right angles to the arc to be quenched, and two substantially U-shaped arcing members disposed at the ends respectively of said set and having each a loop portion and two limb portions, said limb portions extending in parallel to said plates so as to form an integral part of said set, and said loop portions projecting from said set towards said contacts so as to lie close to the ends respectively of said arc in order to cause the current flowing in said loop portions when drawing an arc to coact with the current in the arc to produce a magnetic field for moving the arc into said set.

3. In a circuit breaker having contacts for drawing an arc, and arc quenching means, said means comprising, in combination, a set of individual grid plates disposed substantially in parallel and in spaced relation to each other and extending substantially at right angles to the arc to be quenched, and two substantially U-shaped members disposed at the ends respectively of said set and having each a loop portion integral with two limb portions, said limb portions being arranged in parallel to said plates so as to form a continuation of said set, and said loop portions projecting from said set toward said contacts so as to lie close to the ends respectively of said arc in order to form arcing horns, said set measured at a right angle to said plates being longer than the separating distance of said contacts and said loop portions being inclined towards each other so as to lie close to the ends respectively of the arc to be drawn by said contacts.

4. In a circuit breaker having contacts for drawing an arc, and arc quenching means, said means comprising, in combination, a set of flat grid plates disposed substantially in parallel and in spaced relation to each other and extending substantially at right angles to the arc to be quenched, and a substantially U-shaped arcing member arranged centrally between said plates and having a loop portion and two limb portions, said loop portions projecting from said plates toward and into the path of said arc to split it into two arc portions, and said limb portions extending continuously from said loop portion into said set in parallel to said plates, said set having its two outer plates projecting over the other plates towards said contacts, the projecting portions of said outer plates respectively being inclined toward each other and having their ends disposed close to said contacts in order to form arcing horns for moving said arc portions between the adjacent plates of said set.

5. A double break circuit interrupting device comprising an arc-deionizing structure having a set of spaced grid plates of flat shape, a pair of stationary contacts spaced from said set substantially in parallel to the spacing direction of said plates, a bridging member having a pair of contacts disposed for engagement with said stationary contacts and movable substantially at right angles to said direction, and a conductive U-shaped member having a looped end positioned centrally between said stationary contacts and two limb portions extending from said end toward and between said grid plates so as to form continuous arc guiding surfaces, whereby an arc occurring between said stationary contacts is split into two arc portions and moved along said limb portions toward and between said plates.

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