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O. C. TRAVER

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CIRCUIT INTERRUPTER

Filed July 29, 1926

Fig. 1.

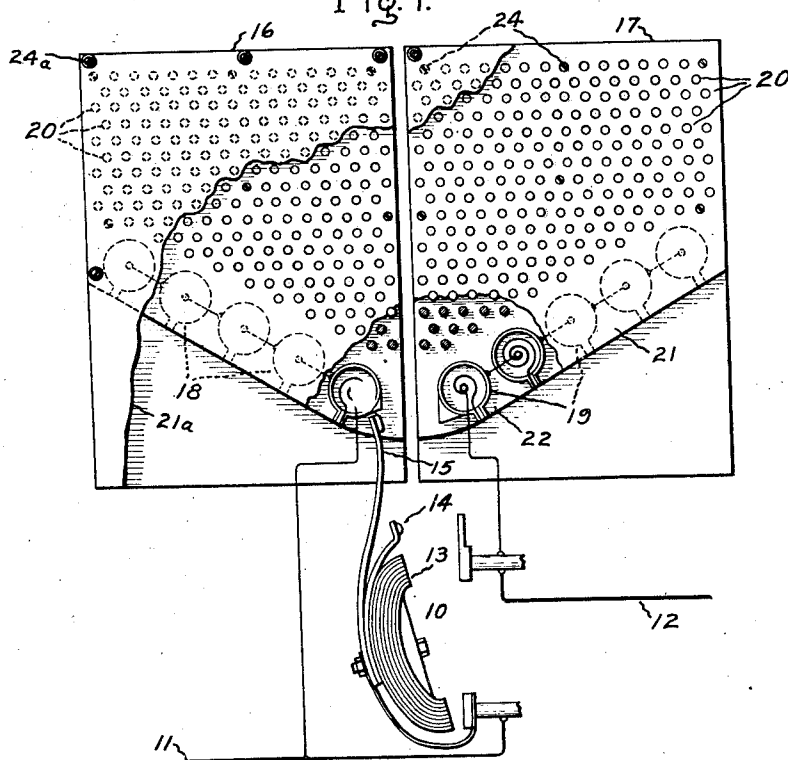
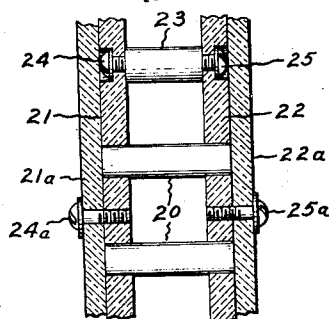


Fig. 2.



Inventor
Oliver C. Traver.
by *Alexander S. Lane*
His Attorney.

UNITED STATES PATENT OFFICE

OLIVER C. TRAVER, OF SCHENECTADY, NEW YORK, ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK

CIRCUIT INTERRUPTER

Application filed July 29, 1926. Serial No. 125,778.

This invention relates to electric circuit interrupters and it provides improved means for dissipating and rupturing the arc occurring upon the interruption of the circuit.

5 More specifically, the improvements provided by the present invention enable the arc occurring upon the interruption of the circuit to be directed along a restricted path and subdivided into a series of separate shorter
10 arcs which are subjected to a cooling action, and preferably also to a magnetic blowout action to effect the extinguishment thereof. Moreover, the subdivision of the main arc into
15 a multiplicity of separate smaller arcs in series serves to increase the sum of the critical voltages thereof beyond the critical voltage of a single arc of the same length and thereby materially facilitates the interruption of the circuit. In this way even a relatively high
20 voltage power arc may be quickly ruptured.

In a preferred embodiment of the invention the arc is confined in an arc chute providing a narrow restricted path therefor and the subdivision of the arc and the cooling of the resulting series of smaller arcs is accomplished
25 by interposing a multiplicity of metallic elements such as small copper bars in staggered spaced relation across the path of the arc. Thus, as the arc passes through the restricted
30 path, preferably being driven by a magnetic blowout action, the battery of metal pieces are encountered and the arc is broken up and jumps between the adjacent metal pieces in a multiplicity of short arcs. The cooling effect
35 on the arc of the many metal pieces, together with the tendency to increase the total length of the arc stream, as well as the marked increase in the critical voltage of the several short arcs in series, combine to effect a rapid
40 interruption of the circuit.

The accompanying drawing illustrates a preferred embodiment of the invention in a circuit interrupter having a magnetic arc
45 blowout chute suitable for high voltage power service. Fig. 1 is a side elevation of the circuit interrupter provided with my improved form of arc dissipating blowout chute with a portion of the latter broken away to more
50 fully reveal the construction thereof, and Fig.

2 is an enlarged sectional view of a portion of the arc blowout illustrated in Fig. 1.

Referring to Fig. 1, the circuit interrupter 10 controlling the continuity of the high voltage power lines 11 and 12 is shown schematically, as the details thereof are not of the essence of my present invention. However, it will be seen that the interrupter 10 as shown is provided with a main current carrying contact 13, which bridges the terminal studs of the lines 11 and 12, together with the primary and secondary arcing contacts 14 and 15.

In the preferred form illustrated, the arrangement for dissipating the arc occurring upon the opening operation of interrupter 10 comprises a pair of arc chutes 16 and 17 which preferably are disposed in alignment to form a restricted path or the arc with a gap therebetween, and each provided with a series of magnetic blowout coils 18 and 19 respectively. The blowout coils preferably are arranged to be connected successively in an arc circuit as the arc lengthens, in the manner more fully described and claimed in my copending application, Serial No. 121,893, filed July 12, 1926, although other forms of magnetic blowout coils may be employed if desired.

In order to subdivide and cool the arc in accordance with my present invention, each of the arc chutes 16 and 17 is provided with a multiplicity of metallic elements, preferably in the form of round copper bars indicated collectively by the numeral 20 on the drawing. These round copper bars are distributed throughout the path of the arc preferably in tapering rows as shown with the succeeding bars opposite the openings between the preceding bars. In order to permit rapid penetration of the arc among the distributed copper bars so as quickly to cool all portions of the ionized metal vapor and gases through which the arc is conducted, the gaps between the adjacent bars preferably are of greater length than the width of the bars, as clearly indicated in the drawing. As shown in detail in Fig. 2, each of the arc chutes is composed of the inner side walls 21 and 22, having a plurality of openings for receiving the copper rods 20 and the outer side walls 21^a and 22^a serve to maintain the rods in position. The

inner walls 21 and 22 may be secured in parallel spaced relation by means of a plurality of spacing bars 23, which are suitably secured to the walls as by the screws 24 and 25, and the outer walls 21^a and 22^a are secured to the inner walls by the screws 24^a and 25^a as indicated in the drawing. It will be evident, however, that the arc chute walls may be maintained in proper spaced relation by other suitable means.

With the arrangement shown, when the main contact 13 and the primary arcing contact 14 of the circuit interrupter 10 are open, the current in the circuit including the lines 11 and 12, is shunted through the first of the series of blowout coils 19 and the secondary arcing contact 15. Thus, as the secondary arcing contact 15 opens and draws an arc, the magnetic blowout action of the first in the series of coils 19 serves to elongate and drive the arc upward along the restricted path formed by the arc chutes 16 and 17. As the arc encounters the initial coil of the series of blowout coils 18, this coil also is included in the arc circuit and exerts a magnetic blowout action tending to further elongate the arc.

As the arc encounters the first row of metallic bars 20, it is subdivided into a plurality of shorter arcs which rapidly jump to the succeeding rows of bars, and thereby further subdivide the arc. At the same time, both ends of the arc are driven upwardly along the respective series of blowout coils 18 and 19. Due to the cooling action upon the arc stream as it is driven through the successive rows of the metal pieces by the magnetic blowout action, as well as the increase in critical voltage of the series of arcs, the energy in the arc is rapidly dissipated and the entire series of short arcs is finally broken to interrupt the circuit between the lines 11 and 12.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. An arc chute comprising members of arc-resisting material spaced apart to form a restricted path for the arc and having multiple rows of metallic elements disposed across the arc path with the elements in the successive rows disposed opposite the openings between the elements in the preceding rows for subdividing and cooling the arc.

2. An arc chute comprising walls of insulating material disposed in parallel spaced relation to provide a restricted path for the arc and a plurality of metallic bars interposed in the arc path between the walls and grouped in spaced relation to progressively subdivide and cool the arc as the arc lengthens.

3. An arc chute comprising side walls spaced apart with a multiplicity of metallic bars disposed in staggered rows between the walls transverse the path of the arc.

4. An arc chute comprising insulating walls spaced apart and each having a plu-

rality of openings therein, a plurality of rows of metallic bars extending across the arc path defined by said walls and having their ends supported in said openings, and insulating means covering the said openings at the ends of said bars.

5. An arc chute comprising insulating walls spaced apart in parallel relation and having a plurality of registering openings therein, a plurality of metallic bars extending transverse the arc path defined by said walls in a series of staggered rows and having their ends supported in said openings, and insulating means covering the said openings at the ends of said bars.

6. A magnetic blowout for interrupting an electric circuit comprising an arc chute formed of insulating walls spaced apart and having a multiplicity of metallic bars extending in staggered relation therebetween with the gaps between the adjacent bars of greater length than the width of the bars, and a magnetic blowout coil interposed between said walls and connected to set up a magnetic field for driving the arc through said gaps to engage with the succeeding bars.

7. A magnetic arc blowout for interrupting an electric circuit comprising a pair of arc chutes disposed in alignment to form a restricted path for the arc with a gap between the adjacent edges of the chutes, a plurality of metallic bars disposed in staggered relation in each of said arc chutes, and a plurality of blowout coils in each arc chute and connected to be successively inserted in the arc circuit for setting up a magnetic field to drive the arc between said metallic bars.

8. A magnetic blowout for interrupting an electric circuit comprising an arc chute and a series of blowout coils having terminals spaced apart in the path taken by the arc as it lengthens and a plurality of metallic bars interposed progressively in the arc path to subdivide and cool the arc as it lengthens.

9. An arc chute having a plurality of metallic arcing electrodes distributed in staggered relation throughout the arc path with the gaps between the adjacent electrodes of greater length than the thickness of the electrodes.

10. An arc chute having a plurality of tapered rows of metallic elements disposed across the arc path to progressively subdivide and cool the arc.

In witness whereof, I have hereunto set my hand this 28th day of July, 1926.

OLIVER C. TRAVER.