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A. CORBETT

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ARC QUENCHER FOR CIRCUIT BREAKERS.

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Fig. 1.

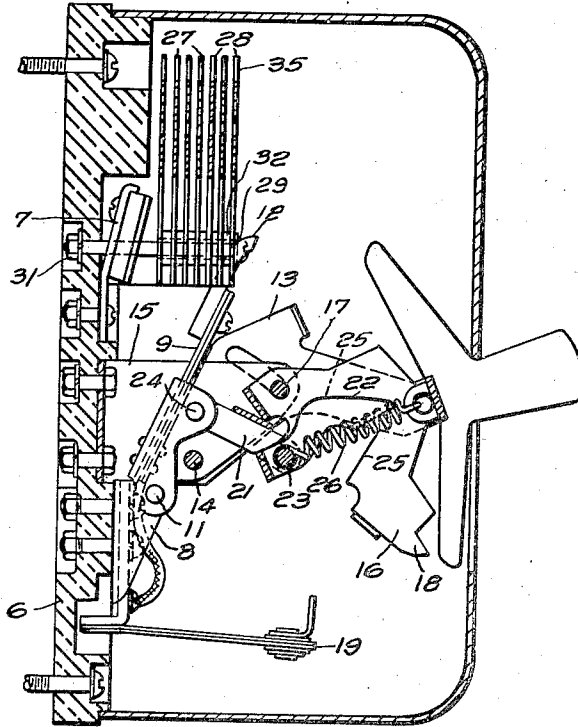


Fig. 2.

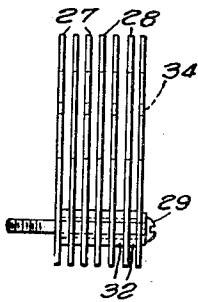


Fig. 3.

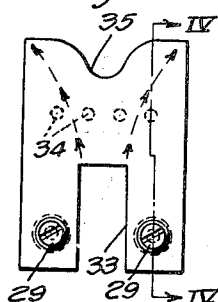
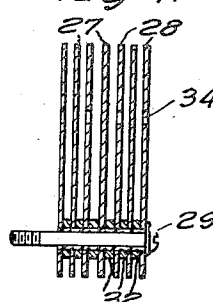


Fig. 4.



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ARC QUENCHER FOR CIRCUIT BREAKERS

Application filed October 29, 1930. Serial No. 491,371.

My invention relates to arc quenchers for circuit breakers and particularly to arc-quenching devices that are adapted for application to circuit breakers for controlling lighting and motor circuits.

An object of my invention is to provide an arc-quenching device for circuit breakers of the type wherein the usual metal deionizing plates or grids are provided with perforations which facilitate ventilation and passage of gas from between any two adjacent grids to the spaces between other grids, thus facilitating the entrance to the stack of grids of the arc drawn in a notch through which the circuit breaker contacts pass.

A further object of my invention is to provide an arc-quenching device wherein the deionizing plates or grids of a stack are provided with aligned notches extending inwardly from the ends of the plates or grids that are opposite to the ends of the grids at which the arc enters, for the purpose of further facilitating ventilation.

A further object of my invention is to provide an arc-quenching device of the deionizing-grid type wherein the arc may be extinguished with greater efficiency, by means of a given number of plates, than has heretofore been found practicable.

These and other objects that will be made apparent throughout the further description of my invention are attained by means of the apparatus hereinafter described, and illustrated in the accompanying drawing, wherein

Figure 1 is an elevational view, partially in section, of the circuit breaker with which my improved deionizing-grid structure is associated,

Figs. 2 and 3 are side and end elevational views, respectively, of the improved deionizing grid structure, and

Fig. 4 is a longitudinal section through the deionizing-grid structure, taken on the line IV—IV of Fig. 3.

Referring to the drawing, the deionizing-

grid structure is shown as applied to a light-duty circuit breaker of the type disclosed in the patent of Fred G. Von Hoorn, No. 1,786,797 issued December 30, 1930, and assigned to the assignee of this application.

Briefly, the circuit breaker comprises an insulating base 6 which supports a stationary terminal contact plate 7 and a bracket 8, to which a switch arm 9 is pivoted by means of a pin 11. A contact plate 12 is attached to the free end of the switch arm 9, a portion of the arm being laminated and sufficiently flexible to permit a slight wiping action of the plate 12 on the plate 7 when moved to its circuit-closing position.

The switch arm 9 is actuated by an operating lever 13 which is pivoted for rotative movement about a shaft 14, the ends of which are supported by a frame 15 mounted on the base 6.

A toggle carrier or cradle 16 is mounted upon a shaft 17 and the carrier is provided with an extension 18 that is held in an operating position by means of a bimetal thermal element 19 that is connected in series with the switch contacts and is mounted on the base 6.

The switch arm 9 is actuated by means of toggle links 21 and 22 that are connected by a knee pivot pin 23. The link 21 is pivoted, at 24, to the switch arm 9, and the link 22 is pivoted upon the carrier 16, the outer end thereof being mounted in a notch 25 of V-shape provided in the carrier. The knee pivot pin 23 of the toggle and the outer end of the operating lever 13 are connected by means of a spring 26.

When the carrier is in the "set" position, indicated in dotted lines in Fig. 1, movement of the operating lever 13 causes the toggle to be moved to the "made" and to the "broken" positions with a snap action by reason of the movement of the outer end of the spring 26 over the center of the toggle link. Since the operating mechanism of the circuit-breaker

apparatus described does not contain any part of my invention, it is believed unnecessary to go into further details of the specific construction thereof.

In order to facilitate extinguishment of the arc drawn between the contacts 7 and 12 when the circuit breaker is opened, I have provided a stack of deionizing metal plates or grids 27 and 28 that are arranged in spaced superimposed relation, as indicated in the drawing, and are supported upon the base 6 and secured thereto by means of screws 29 that extend through the stack of plates and are clamped in position by the nuts 31, the plates being held in spaced relation and insulated from one another by insulating washers 32.

Aligned rectangular notches or slots 33 extend inwardly from the front-end edges of the plates 27 and 28, through which the movable contact 12 passes and in which the arc is drawn between the contacts 7 and 12.

Deionizing-grid structures of the type above described are disclosed in the copending application of Oliver S. Jennings, Serial No. 606,565, filed December 13, 1922, and assigned to the assignee of this application.

In certain applications, where the space limitations limit the number of plates or grids that may be used and where relatively close spacing of the grids is necessitated in order to reduce the over-all dimensions of the grid structure and where it is expedient to separate the circuit-breaker contacts the distance usually required for a successful interruption of the circuit, it has been found that, because of the close spacing of the grids and their relatively thin structure, some resistance is offered to the entrance of the arc into the spaces between the grids, and that an arc may be held out of the stack of deionizing grids a sufficient length of time, even though but a fraction of a second to cause burning of the grids.

Because the grids are relatively thin, their heat-absorbing capacity is limited, and it becomes necessary to move the arc rapidly into the spaces between the grids the instant it is formed and to cause the arc to move through the stack of grids at relatively high velocities. Where the grids are spaced relatively close, as in the present instance, arc gases formed immediately upon entrance of the arc into the spaces between the grids generate sufficient pressure to reduce the velocity of the arc longitudinally and deflect it so that its course through the stack is from a corner of the slot 23 to a side of the stack, which course is considerably shorter than that from the inner end of the slot to the rear end of the stack.

In order to overcome this difficulty, I have provided each alternate plate or grid 27 with perforations 34, which provide sufficient ven-

tilation between the spaces of adjacent plates to overcome the tendency of the gas to deflect and inhibit the arc, and as a result of these perforations, the arc moves longitudinally at a relatively high velocity and in the arc path indicated by the arrows in Fig. 3, which is the longest possible path through the stack of grids, there being a tendency of the arc to drift from one corner of the notch 33 to a rear corner of the stack.

In order to further facilitate ventilation of the stack of grids, I have provided aligned notches 35 which extend inwardly from the rear edges of the plates, at a point near the center thereof, these slots readily permitting escape of gases from the spaces between the grids. The absence of metal at this point also assists in defining the course of the arc through the stack of grids, since the arc is influenced by the magnetic-flux lines set up in the grid structure, it being understood that the arc is split into a series of arcs and, so long as the arcs endure, current passes through the grids which are then connected in series in the circuit. The field about the arcs drives them through the stack of plates and they are extinguished within a few cycles and before they actually reach the rear end of the stack, by reason of the deionizing and cooling effect of the grids.

While I have disclosed the perforations 34 disposed in a row, as indicated in Fig. 3, it will be understood that the perforations may be staggered and located at advantageous points in the grids, and that all of the plates may be provided with perforations, under certain operating conditions, to secure proper ventilation of the spaces between the grids.

By reason of the grid structure above described, it has been found possible to reduce the number of grids required and to reduce the external dimensions of the grid structure sufficiently to permit of application to small circuit breakers, such as are used in distributing panels and entrance-circuit-breaker-meter service.

While I have described and illustrated but one embodiment of my invention, it will be apparent to those skilled in the art that various changes, modifications, substitutions, additions and omissions may be made therein within the spirit and scope of my invention, as set forth in the appended claims.

I claim as my invention:

1. An arc-quenching device for circuit breakers comprising a plurality of superimposed spaced metal plates having aligned slots extending inwardly from the front edges thereof through which the movable contact of the circuit breaker is moved and in which the arc is drawn, each alternate plate having perforations therethrough between the inner end of the notches and the rear edges of the plates,

2. An arc-quenching device for circuit breakers comprising a plurality of superimposed spaced metal plates having aligned slots extending inwardly from the front edges thereof through which the movable contact of the circuit breaker is moved and in which the arc is drawn, the said plates having notches extending inwardly from their rear edges adjacent to the center thereof for facilitating venting of the gases.

In testimony whereof, I have hereunto subscribed my name this 20th day of October, 1930.

ALFRED CORBETT.