June 30, 1964 A. LATOUR 3,139,503

EXTINGUISHING DEVICE FOR ELECTRICAL ARCS

Filed July 18, 1961

Fig. 1

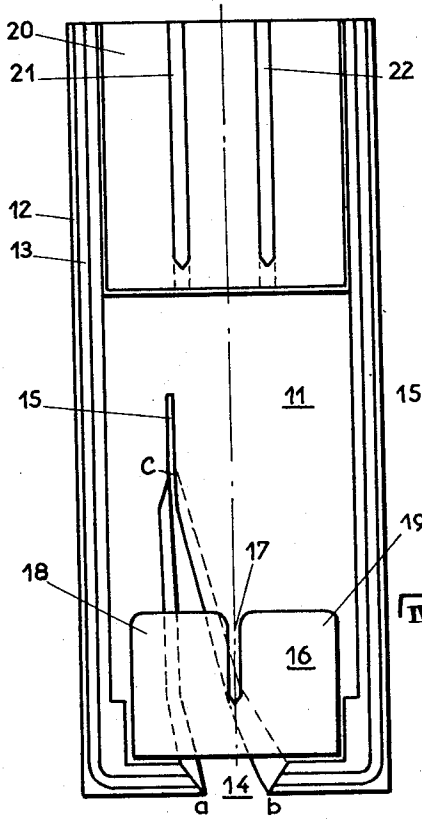


Fig. 3

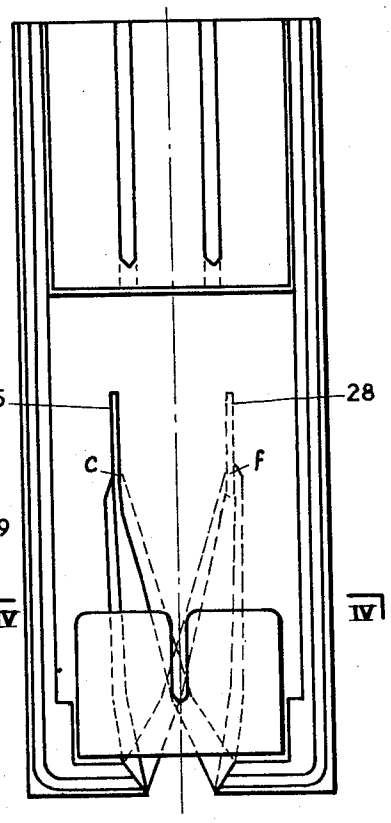


Fig. 2

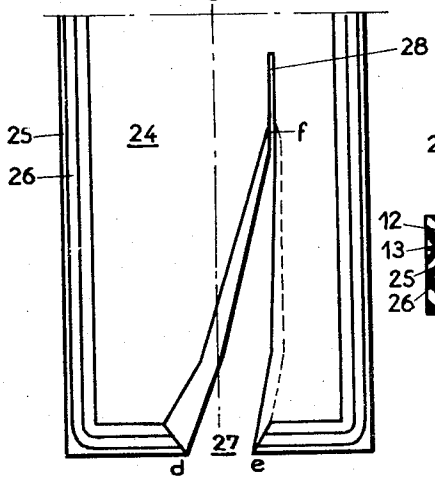
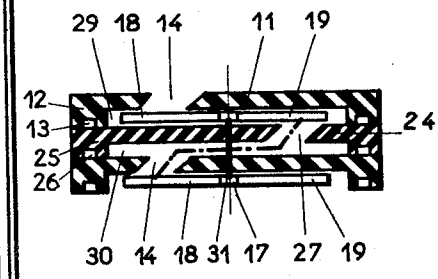


Fig. 4



United States Patent Office 3,139,503 Patented June 30, 1964

3,139,503

EXTINGUISHING DEVICE FOR ELECTRICAL ARCS

André Latour, Grenoble, France, assignor to Etablissement Merlin & Gerin, Grenoble, France

Filed July 18, 1961, Ser. No. 124,906
3 Claims. (Cl. 200—144)

This invention relates to extinguishing devices for electrical arcs drawn between separable contact members located in an arc formation chamber of an electrical circuit breaker, and more particularly to extinguishing devices of this type having an arc extinguishing chamber which comprises a set of at least two parallel plates of insulating material spaced apart from one another and disposed transversely of the direction of separation of the contacts or the initial direction of the arc.

The spaced parallel plates of insulating material define narrow arc separating or extinguishing chambers and are provided with conductive members which are generally V- or U-shaped and whose legs or wings embrace or straddle the individual insulating plates. Conductive members of this general type and configuration are disclosed in my U.S. Patent No. 2,707,739. The web portion of the V- or U-shaped conductive member straddles the side or edge of an insulating plate while the legs or wings of the conductive member extend along the faces of the insulating plates in a substantially parallel arrangement. The opposed parallel wings of each conductive member are slightly offset or diverging relative to each other. Conductive members or paths are thus provided on the faces of the insulating plates which attract and conduct the arc drawn between the insulating plates in such a manner as to turn the arc to form expanding curved or looped configurations within the narrow spaces between the insulating plates. The initial arc in contact with the conductive members is thus subdivided into a number of partial arcs which enter the extinguishing chambers where they are extended and developed into loops of substantially oblong form. The partial arcs are effectively cooled upon coming in contact with the adjacent parallel plates of insulating material and are thereby extinguished.

In this general type of arc extinguishing apparatus it is advantageous to conduct the initial arc or arc portions between the narrow spaces of the extinguishing chambers by means of a magnetic field generated by the arc loops which are developed by the arc proper as is customary in this type of arc extinguishing arrangement.

It is an object of the invention to replace the straddling conductive members whose legs extend along the two faces of the insulating plates by conductive members of simpler structure having a better resistance against electrodynamical and thermal effects.

It is another object of this invention to reduce the number of insulating plates without changing the total length of the arc portions.

These and other objects and features of the invention will become apparent upon reading the specific description of the invention in connection with the accompanying drawing which forms part of the specification. In the drawing:

FIG. 1 shows, on a reduced scale and diagrammatically, a front view in elevation of an insulating plate provided with a conductive member.

FIG. 2 is a front view showing the lower part of an intermediate plate.

FIG. 3 shows a stack of three successive insulating plates.

FIG. 4 is a cross-section along line IV—IV of FIG. 3.

Referring now to the various figures of the attached drawing, numeral **11** designates a support plate of insulating material for a conductive member **16**. The plate has a peripheral flange or reinforcing member **12** provided with a groove **13** in which a suitable gasket is disposed.

The plate is provided with a cut-out portion or notch **14** having a substantial triangular configuration. The base *a–b* of the triangle is disposed symmetrically with reference to the longitudinal axis of the plate. The point *c* designating the top of the notch is displaced to the left of said longitudinal axis and is preferably extended upwardly by means of a narrow slot **15** having the shape of a saw-cut. A flat conductive member **16** divided by a slot **17** into two legs or wings **18** and **19**, is connected in a suitable manner on one face of the lower portion of the plate. The edge *b–c* of the notch **14** is so disposed that the plate **11** covers the slot **17** of the conductive member **16**. The two edges *a–c* and *b–c* of the notch **14** are provided with chamfered portions. At the upper portion and on one side of the plate, flame arrestors **20** are connected to the plates. Ribs **21** and **22** which constitute spacer means for the adjacent plates are mounted on the flame arrestors.

The intermediate plate **24**, which does not carry any conductive element, shown by FIG. 2 has a like peripheral flange **25** provided with a groove **26** in which a suitable gasket is disposed. This plate is provided with a notch **27** of substantial triangular configuration. The notches **14** of plate **11** and **27** of plate **24** are symmetrical with reference to the longitudinal axis of the plates, the point *f* being displaced to the right relative to said axis as is shown by FIG. 3 showing a stack of three successive plates. The device according to the invention comprises evidently a great number of stacks as shown by this FIG. 3. The edges *d–f* and *e–f* of the notch **27** are in a like manner provided with chamfered portions and the edge *d–f* is so disposed that the plate **24** covers the slot **17** of the conductive member disposed on the confronting face of the next plate. Laminar spaces **29** and **30** (FIG. 4) are provided between successive plates in order to allow the arc portions to enter in these spaces where they are extinguished.

In this arrangement, the initial arc, drawn between the contacts, rises and reaches the conductive members where it is subdivided into a number of partial arcs which enter the extinguishing chambers. One of these partial arcs is diagrammatically shown by the line **31**. The arc portions rising into the chambers come in contact with the edge *b–c* of the notch **14**, on the one hand, and with the edge *d–f* of the notch **27**, on the other hand, whereby the roots of the arc portions are obliged to move onto the wings **18** and **19** of two successive conductive members. The arc portions take now, seen in horizontal projection, an oblique position, shown by the dotted line of FIG. 4. Continuing their movement, the roots of the arcs are shifted to the upper edges of the wings **18** and **19** of successive conductive members whereby the arc portions penetrate into the notches **14** and **27** until they reach the point *c* and *f*. The arc path is now **18**–*c*–*f*–**19** (FIGS. 3 and 4). When the current intensity becomes sufficiently weak and the arc column diameter decreases, the arc may penetrate into the slots **15** and **28**. At this time new cooling surfaces are able to sufficiently de-ionize the hot circuit breaker gases.

It will be observed that the roots of the arc portions move during a part of their path along the surface of the conductive members and shift only at the end of their displacement onto the edges, thus reducing considerably the thermal exposure of these edges.

It is understood that the conductive members may have a different shape. Thus simple plates without a slot or V- or U-shaped members could be used.

The thermal energy developed during the extinction

of high current arcs can make it desirable to insert more intermediate plates between two support plates **11** and **24**. Evidently the tops of the notches of two successive plates must, in all cases, be displaced with respect to each other.

What is claimed is:

1. In a circuit breaker having structure for establishing an arc and an arc extinction chamber, the combination comprising a plurality of pairs of spaced insulating plates in said chamber, the insulating plates of each pair having elongated slots formed therein and respectively positioned on alternate sides of the axis of symmetry of the chamber thereby forming with the inter plate spacing a sinusoidal arc passage normal to the direction of the original arc through the chamber, a conducting plate having an upper and lower edge positioned in sandwiched relationship between each pair of insulating plates, each slot extending from the base of the insulating plates, said conducting plate having its lower edges substantially flush with the lower edge of said insulation plates upward beyond the upper end of the conducting plate.

2. The invention as defined in claim 1 wherein the conducting plate is rectangular and has a horizontally extending upper edge, the slots in the insulating plates extending from the base of the conducting plates beyond the upper edge.

3. The invention defined in claim 1 wherein the edges of the slot in the insulating plates are beveled, so as to conform with said sinusoidal arc passage path.

References Cited in the file of this patent

UNITED STATES PATENTS

2,740,021	Frink	Mar. 27, 1956
2,888,539	Latour	May 26, 1959