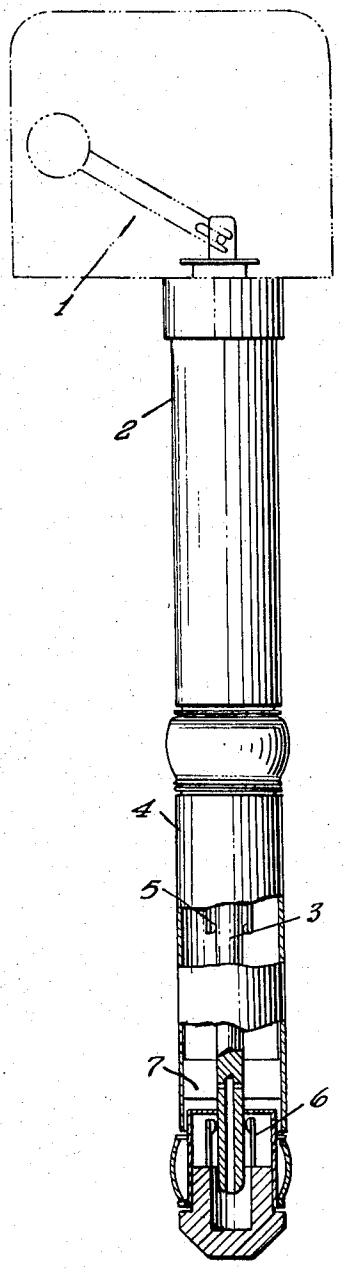
Jan. 10, 1967 P. PICARD ET AL 3,297,848

OIL SWITCH HAVING ANTI-FLASH DEVICE FOR RESTRICTING ARC TYPE DISCHARGES UPON SWITCH OPENINGS

Filed April 27, 1964 2 Sheets-Sheet 1

Fig. 1.



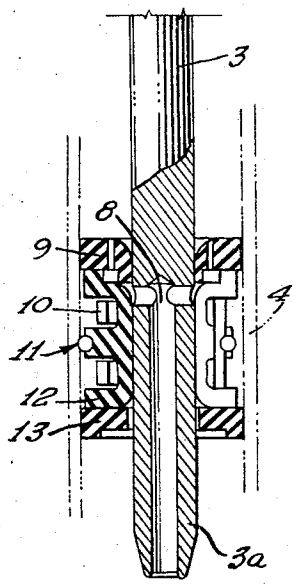


Fig. 2

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Fig:3

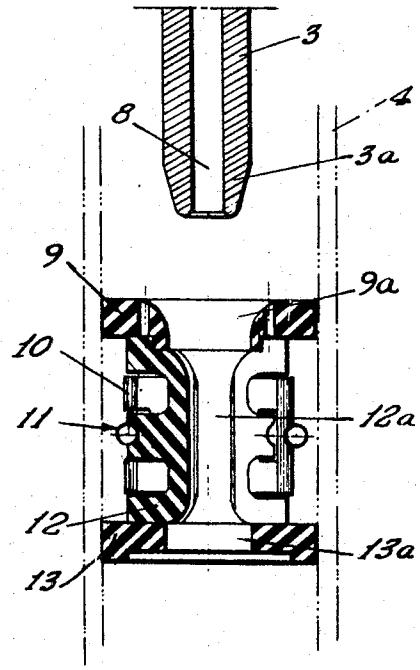
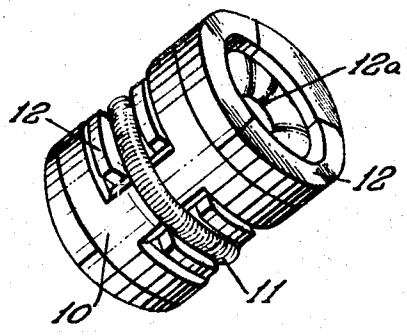


Fig:4.



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OIL SWITCH HAVING ANTI-FLASH DEVICE FOR RESTRICTING ARC TYPE DISCHARGES UPON SWITCH OPENINGS

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4 Claims. (Cl. 200—150)

Medium-voltage load-break switches are adapted to break electrical circuits wherein the current strength varies from a few amperes to several hundreds amperes with cos φ values varying from 0.1 to 1 and with variable recovery voltages.

The most popular devices of this type are those wherein the circuit break takes place in air, the flashover extinction being obtained either by pneumatic blowing or by magnetic blowing. All these systems have the inherent drawback of being of irreducible size, thereby preventing the desirable reduction in the over-all dimensions of functional shielded distribution stations.

To avoid this drawback the use of compressed gases as insulating agents and as extinguishing or blowout substances has been proposed; this solution, however, leads to apparatus scarcely consistent with the ruggedness and sturdiness required in the case of mass-produced apparatus.

Oil switches and "self-blowing" switches are ill-suited for interrupting low-current circuit because of the moderate energy values of the flashovers. They lead to relatively high flashover lengths and voltages and, therefore, to considerable overloads during breaks, not to mention a premature carbonization and aging of the oil. Oil-injection apparatus is relatively complicated and furthermore is objectionable in that it causes the current to be "torn off" before its passage to 0 value, thus producing still higher overloads.

More particularly, in switches operating by the axial shifting of a contact rod, the flashover propagation is counteracted by so-called "anti-flash apparatus" or "anti-flash baffles" consisting of stacked insulating rings disposed in the path of said rod, between the contacts.

However, it may be noted that in these anti-flash baffles (which are static devices, i.e., stationary) the phenomena take place therein without any possibility of control; therefore, this system leads to a design based only on experience or trial-and-error work.

The anti-flash device according to this invention is applicable to breaker switches of the type utilizing a fluid such as oil and designed with a view to breaking high-voltage and medium-voltage alternating currents up to several hundred amperes with the cos φ determined according to the various standards, without overload and without the occurrence of any external phenomenon, and with very short flashover durations

Basically, this anti-flash apparatus is characterized by the fact that it comprises of movable elements urged by elastic means towards each other subsequently to the extraction of the connecting member when the break takes place.

Other features and advantages of this invention will appear as the following description proceeds with reference to the accompanying drawing illustrating diagrammatically by way of example a typical embodiment of the apparatus constituting the subject matter of this invention. In the drawing:

FIG. 1 is a diagram illustrating a conventional breaker and showing the position of an anti-flash device in accordance with this invention;

FIGS. 2 and 3 are sectional views showing an anti-flash apparatus according to this invention, the contact rod being shown in its two extreme positions, respectively; and

FIG. 4 is a perspective view of the same chamber.

As clearly shown in FIG. 1, the switch comprises at least one terminal or pole 2–4 disposed vertically and parallel to the lower portion of a snap-action control mechanism 1 adapted to shift a corresponding contact rod 3; the apparatus illustrated comprises one contact rod per terminal or pole.

These terminals or poles consist of electrically insulating tubes comprising preferably two sections 2, 4, section 4 surrounding a sliding contact 5 and carrying at its lower end a break contact 6 of suitable design or type.

In its lowermost position this rod 3 establishes an electrical connection between the lower contact 6 and sliding contact 5.

To avoid the propagation of the flashover occurring when the rod 3 is moved away from contact 6, an anti-flash insulator 7 is disposed above this contact and, therefore, between the contacts 5 and 6.

The anti-flash device (see FIGS. 2, 3 and 4) according to this invention comprises of a plurality of members 12 having in cross-sectional view the configuration of a circular sector, these members being juxtaposed by their radial planes and enclosed in a cage 10 whose outer diameter corresponds substantially to the inner diameter of pole 4.

The members 12 define a central or axial passage 12*a* having a smaller diameter than the contact rod 3; a circular coil tension spring 11 surrounds both the cage 10 and the members 12 (this spring fitting in a peripheral groove formed in said members) and urges these members towards one another (i.e. inwardly).

This apparatus is completed by a disc 9 formed with a funnel-shaped central orifice 9*a* which by co-acting with the anti-flash apparatus effects the proper centering of the device in relation to rod 3. Another disc 13 with a central passage 13*a* acts as a guide member to said rod as it moves toward the lower contact 6.

During the circuit-closing movement the contact rod 3 passing through the orifice of the upper disc 9 moves the jaw elements 12 away from one another and engages the long contact 6, thus establishing an electrical connection between this sliding contact 5 and the contact 6; under these conditions the jaw elements 12 are resiliently urged against the side face of the contact rod (see FIG. 3).

During the contact-breaking operation the mechanism 1 pulls the contact rod upwardly at the proper speed. Any arcing between the rod end and the break contact is directed towards the passage 12*a*, in this space bounded by the insulating elements 12 it remains properly centered and its length is a minimum when the contact rod 3 moves away from the anti-flash apparatus, the sectors 12 closing with a snap like an insulating throttle, thus reducing the cross-sectional area 12*a* available for the flashover. Under these conditions the flashover is kept within a very narrow gap or space.

Arcing is counteracted both by the throttling action exerted thereon and by the turbulence produced in the oil filling of the enclosure 4 by the radial movements of jaw elements 12.

Of course, various modifications may be brought to the embodiment shown and described herein without departing from the spirit and scope of the invention; thus, notably, an anti-flash device according to this invention may be used in single-tank switches, the term "switch" being taken in its broadest meaning without any consideration of its specific use with or without control mechanisms.

What is claimed is:

1. An electrical oil circuit-breaking switch, comprising a generally tubular enclosure of an electrically insulating

material containing an oil filling; a conductive rod axially shiftable within said enclosure; first contact means slidably engaging said rod and second contact means within said enclosure axially spaced from said first contact means and engageable by said rod upon shifting thereof between an open-circuit position and a closed-circuit position; and an anti-flash device within said enclosure between said first and second circuit means for restricting the development of an arc discharge between said second contact means and said rod upon withdrawal of said rod from said second contact means, said anti-flash device comprising a tubular cage generally coaxial with said rod, a plurality of electrically nonconductive sectoral elements received in said cage and radially shiftable therein, said elements defining in an innermost position thereof a peripherally closed tube having an axial aperture for said rod of a cross-sectional area smaller than that of said rod to restrict the area surrounding an established arc upon withdrawal of said rod through said device, thereby throttling the path of the arc and creating turbulence in said oil filling, spring means surrounding said elements for urging same inwardly but enabling resilient expansion of said elements radially outwardly by said rod upon insertion of said rod through said cage between said elements, and means on said cage spanning substantially the entire cross-section of said enclosure surrounding said rod for blocking the passage of a discharge past said device other than through said axial passage.

2. A switch as defined in claim 1 wherein said cage is provided with a pair of centrally apertured axially aligned

disk-shaped members at opposite extremities of said cage, each of said members facing one of said contact means, at least the member facing said first contact means being flared outwardly in the direction thereof to form a centering passage for guiding said rod between said elements, the member facing said second contact means passing said rod upon its insertion through said device.

3. A switch as defined in claim 1 wherein each of said elements has an intermediate portion extending radially outwardly through said cage and said spring means includes a coil spring circumferentially surrounding said cage and said elements and bearing inwardly upon said intermediate portions thereof.

4. A switch as defined in claim 2 wherein said elements slidingly engage said members and said members are continuous annular rings for blocking the passage of a discharge along outer portions of said elements.

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