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ELECTRIC CIRCUIT INTERRUPTER

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Fig. 1.

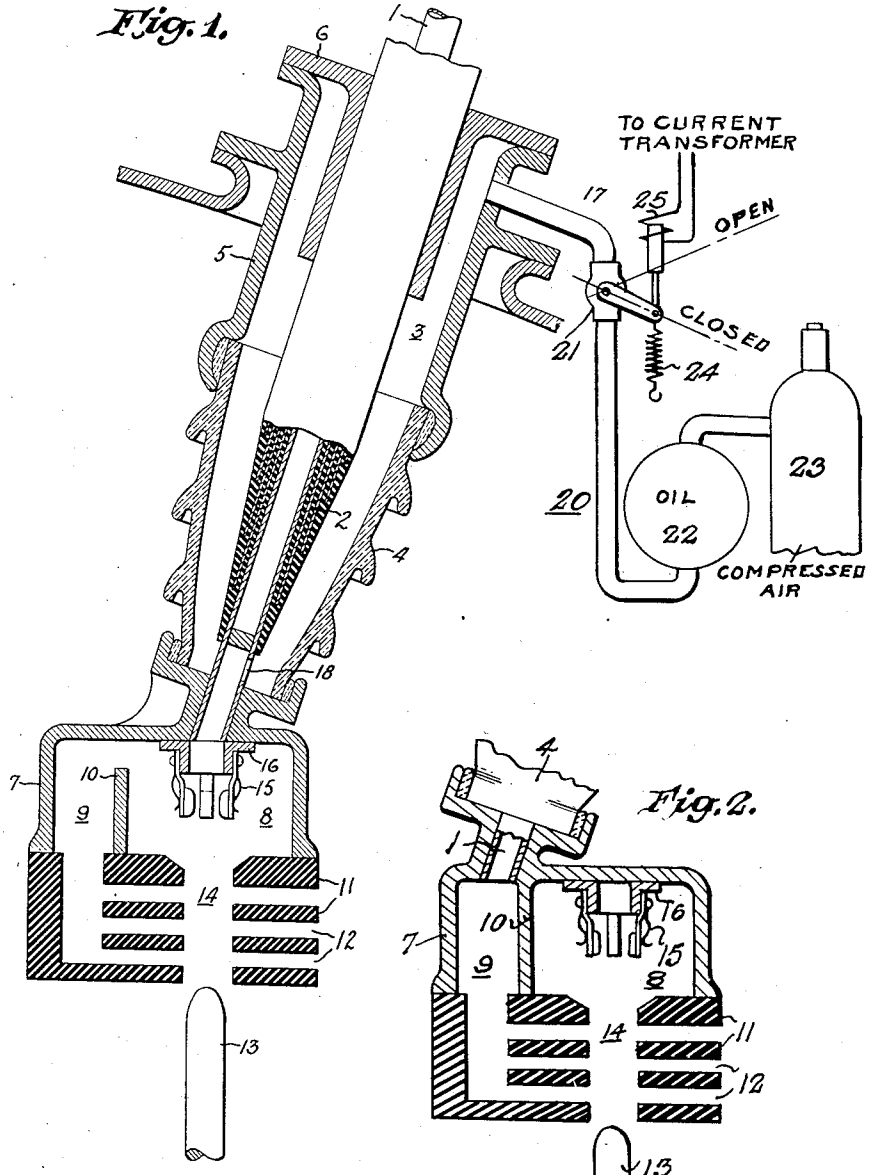

Fig. 2.

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ELECTRIC CIRCUIT INTERRUPTER

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5 Claims. (Cl. 200—150)

This invention relates to the fluid break or oil immersed type of circuit interrupters. Electric circuit interrupters of this kind are known in which a moving contact moves through one or more passages into and out of a casing or shrouding forming a chamber in which the fixed contact of the interrupter is located and in which a body of arc-extinguishing or insulating fluid is segregated from the remaining part of the insulating fluid in the oil tank. Such chambers are commonly known as explosion pots. In circuit interrupters of this kind when the connection between the fixed and moving contacts is broken an arc is formed and a pressure is set up within the explosion pot which as the moving contact moves out of the explosion pot causes a blast of oil and/or gas to be projected over the surface of the moving contact which extinguishes the arc formed between the contacts, or at least so increases the resistance of the arc path, as to bring about rapidly the subsequent extinction of the arc.

The blast of oil or gas may issue through the orifice by which the moving contact enters and leaves the explosion pot and/or through one or more passages transverse to the path of movement of said contact, said passages being formed by a series of plates for example spaced apart and forming the lower portion of the explosion pot. Such constructions are quite well known. If the current passing through the arc is very small, as is often the case with high tension circuit interrupters, the energy of the pressure set up in the explosion pot may not cause a sufficient blast of oil and gas to pass over the moving contact and consequently the arc will not be efficiently extinguished. It is known to make use of oil under pressure to accelerate arc extinction, but in all such inventions the oil is introduced into the main tank or container, and passes thence across the contacts towards the air space in the top of such a tank.

A principal object of the present invention is the provision of an improved liquid immersed circuit interrupter which is effective efficiently to interrupt high tension power circuits throughout the operating range of current values.

According to one aspect of the present invention an oil immersed circuit interrupter comprises a tubular leading-in conductor and a confined space surrounding said conductor and in communication with the interior thereof, into which space insulating liquid under pressure may be supplied, the arrangement being such that on breaking the circuit, a suitable valve is operated which releases the supply of said insulating liquid, which is ejected from the tubular conductor into the explosion space.

This invention will be more fully set forth in the following description referring to the accompanying drawing, and the features of novelty which characterize this invention will be pointed out with particularity in the claims annexed to and forming a part of this specification.

Referring more particularly to the drawing, Fig. 1 is an elevational view, partly in section and partly diagrammatic, illustrating an electric circuit interrupter embodying the present invention, and Fig. 2 is an elevational sectional view of a modified form of the explosion chamber shown by Fig. 1.

In the drawing 1 is a tubular leading-in conductor surrounded by a condenser bushing 2. Around the contact and bushing is an annular space 3, enclosed by an arc shield 4 preferably of porcelain, and as shown completed by a casing 5 and a flanged bushing 6. The end of the space being closed by the explosion pot 7, clearly the enclosure of the space within the arc shield might be completed in other ways. The explosion pot 7 forms an explosion or interrupting chamber 8 and a side chamber 9 which is partially separated from the explosion chamber by a partition 10.

In an alternative construction as shown by Fig. 2, the opening at the bottom end at the tube 1 is taken directly into the auxiliary chamber 9, which is completely separated from the main arcing chamber 8. Thus all insulating liquid under pressure in the chamber 9 is forced to traverse the arc path at right angles along the channels 12, and no portion can escape through the central opening 14.

A series of plates 11 form lateral passages 12 whilst the moving contact 13 passes along a tunnel 14 through the plates 11 to engage with spring contacts 15.

Normally the chambers 8 and 9 and passages 12 are filled with oil and when the circuit is broken the explosion caused by the arc forces the oil partly down the tunnel 14 and then across through the lateral passages 12, and partly around the partition 10 into the chamber 9 and thence through the lateral passages 12 so as to break the arc. In the explosion chamber type of switch the blast pressure is dependent on the arc current. Accordingly, when the arc current is low the blast pressure may be inadequate. In applying the present invention to such a construction additional oil is supplied under pres-

sure from a separate source such as through a pipe 17 to the chamber 3 whence it passes through an aperture 18 into the interior of the tubular conductor 1.

In the arrangement shown by way of example, a source of oil pressure, generally indicated at 20, is connected to the pipe 17, a valve 21 controlling the application of pressure. The source 20 may suitably comprise an oil storage tank 22 and a bottle of compressed air 23.

The valve 21, which is normally biased closed by a spring 24, is suitably connected to a solenoid 25 energized from the usual current transformer. When the current transformer is energized in response to excess current to trip the breaker in the usual manner (not shown), the valve 21 is also opened to connect the oil pressure source 20 with the explosion chamber.

It will, of course, be apparent that a mechanical arrangement may be used if desired to interconnect the breaker trip mechanism and valve 21.

When the switch is closed, the valve associated with the conventional circuit breaker mechanism closes the source of supply to 17, and thus prevents emission of oil from the interior of contact 1. When, however, the trip mechanism is operated in order to break the circuit, the valve also opens, permitting emission of oil from the interior of tubular conductor 1 into the explosion chamber, and this will augment and assist the oil pressure caused by the arc, in the manner explained above. It will therefore be noted that the additional oil is admitted to the explosion chamber under pressure from a source separate from and independent of the arc pressure generated in the explosion pot. The conductor 1 need only be hollow at the lower end so as to provide a passage through the hole 18 from chamber 3 to explosion pot 8 or auxiliary chamber 9.

It should be understood that this invention is not limited to specific details of construction and arrangement thereof herein illustrated, and that changes and modifications may occur to one skilled in the art without departing from the spirit of this invention.

We claim:

1. A liquid immersed circuit interrupter comprising fixed and moving contacts, an explosion pot containing oil surrounding said contacts, means forming oil passages arranged so that oil is forced by arc pressure generated in said pot along said passages laterally across the path of the moving contact, and means for supplying to said explosion pot upon opening of the circuit additional oil under pressure from a separate source during the breaking of the circuit for augmenting said arc pressure at low current.

2. A liquid immersed circuit interrupter comprising fixed and moving contacts, a tubular leading-in conductor terminating in said fixed contact, an explosion pot having exhaust passages surrounding said contacts, the arc pressure generated in said pot upon separation of said contacts directing arc-extinguishing jets of liquid through said passages, and means for admitting upon opening of the circuit insulating liquid under pressure from a source other than the explosion chamber pressure through said tubular lead in to said explosion pot for augmenting said arc pressure at low current.

3. A fluid immersed circuit interrupter comprising relatively movable contact structure, means forming an interrupting chamber within which said contact structure coacts and within which arc pressure is generated upon opening of the circuit, said arc pressure expelling fluid from said chamber through the arc path for extinguishing the arc, and means for directing across the arc path additional fluid under pressure from a source independent of said arc pressure in accordance with the circuit opening operation.

4. A fluid immersed circuit interrupter comprising relatively movable contact structure, an explosion pot containing an arc-extinguishing fluid surrounding said contact structure in the closed circuit position, said pot having an exhaust passage arranged with respect to said contact structure so that the arc pressure generated in said pot upon opening of the circuit expels fluid through said passage into the arc path, and means for admitting to said pot in accordance with each circuit opening operation additional arc-extinguishing fluid under pressure from a source other than said explosion pot pressure for augmenting at low current said arc pressure.

5. A liquid immersed circuit interrupter comprising an explosion pot containing an arc-extinguishing liquid, relatively movable contact structure coacting in said pot, said pot having an exhaust passage through which the movable contact structure is actuated to open and closed circuit positions, the arc pressure generated in said pot upon opening of the circuit expelling liquid through said passage into the arc path, and means for admitting to said pot additional arc extinguishing liquid under pressure from a source independent of the value of current to be interrupted.

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