

May 8, 1934.

R. FISCHLER

1,958,362

CIRCUIT BREAKER

Filed March 6, 1930

2 Sheets-Sheet 1

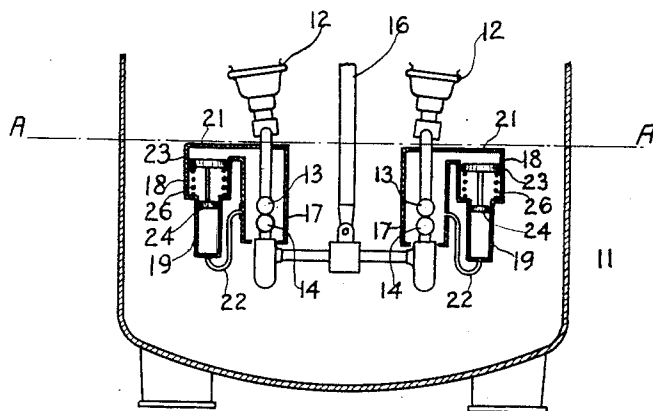


Fig. 1.

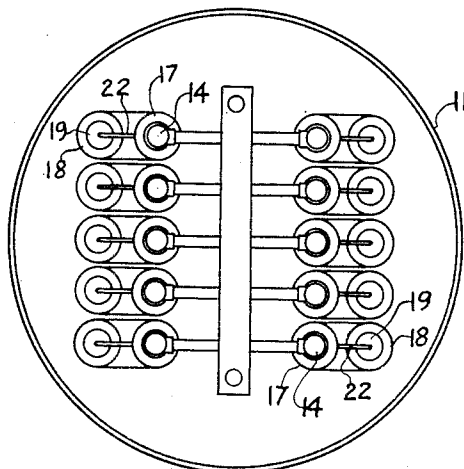


Fig. 2.

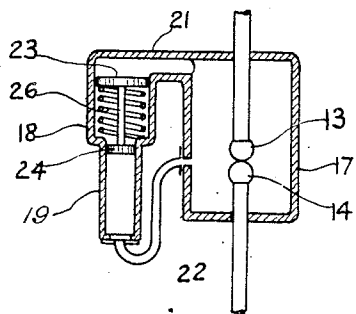


Fig. 4.

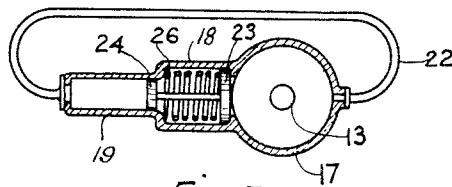


Fig. 5.

Inventor
Robert Fischler
By *Alfred H. Dyson*
Attorney.

May 8, 1934.

R. FISCHLER

1,958,362

CIRCUIT BREAKER

Filed March 6, 1930

2 Sheets-Sheet 2

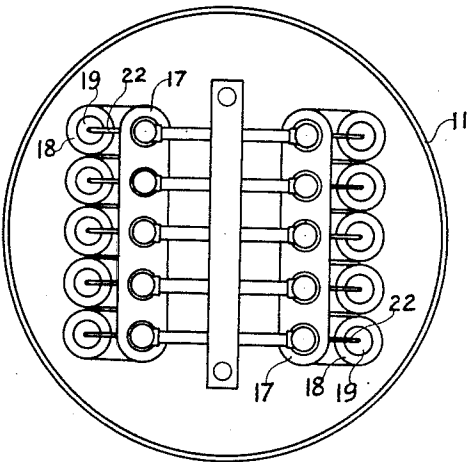


Fig. 3

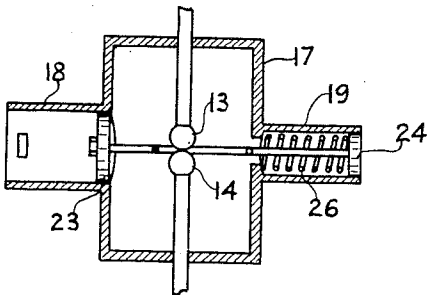


Fig. 6

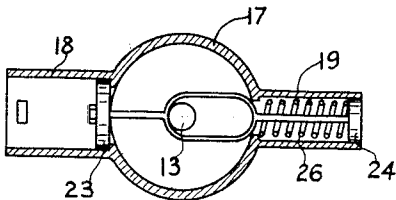


Fig. 7

Inventor
Robert Fischler
By *Alfred H. Dyeon*
Attorney.

UNITED STATES PATENT OFFICE

1,958,362

CIRCUIT BREAKER

Robert Fischler, Baden, Switzerland, assignor to
Aktiengesellschaft Brown Boveri & Cie., Baden,
Switzerland, a joint-stock company of Switzer-
land

Application March 6, 1930, Serial No. 433,548
In Germany March 15, 1929

2 Claims. (Cl. 200—150)

This invention relates to improvements in electric circuit controlling means and, more particularly, to oil switches having means associated therewith for quenching the arc occurring therein when the switch is opened.

In the usual oil switch in which the switch contacts were operated in oil, the arc occurring between the contacts when the circuit was broken, created a gas bubble in passing through the oil, immediately above the contacts. Such gas bubbles were capable of excluding the oil from the vicinity of the arc and an explosion of the gas frequently occurred. If means are provided for utilizing the expansive forces of the gases to force a current of oil between the contacts, the arc is broken much more quickly than heretofore and is broken without the danger of explosion present heretofore.

It is, therefore, among the objects of the present invention to provide means associated with an oil switch for utilizing the expansive forces of the gases produced upon opening of the switch to force a stream of oil between the contacts.

Another object of the invention is to provide a pump-like structure interiorly of the oil switch tank which structure will utilize the kinetic energy of the gases occurring upon opening of the switch to eject a stream of oil between the contacts.

Another object of the present invention is to provide a cylinder and piston arrangement to receive the expanding gases caused by opening of the switch which arrangement is connected with a smaller piston and a cylinder filled with oil, in such manner that expansion of the gases in the larger cylinder causes an ejection of oil between the contacts from the smaller cylinders.

Objects and advantages, other than those above set forth, will be apparent from the following description and the drawings in which:

Figure 1 is a partial cross-sectional embodiment of the arc-quenching means applied to a pair of the contacts of an oil switch;

Fig. 2 is a top plan view of one embodiment of the invention taken on the line A—A of Fig. 1.

Fig. 3 is a view similar to that shown in Fig. 2, but differing therefrom as will be explained hereinafter;

Fig. 4 is an enlarged detail view of the arc-quenching means illustrated and described with relation to Fig. 1;

Fig. 5 is a sectional view of a modified form and arrangement of the arc-quenching means which may be required by structural and operating conditions of some installations;

Fig. 6 shows, in vertical cross-section, a modified form of the structure in which the cylinder portions are arranged horizontally and on opposite sides of the arc-quenching chamber, and

Fig. 7 is a horizontal cross-section of the modification shown in Fig. 6.

Referring more particularly to the drawings by characters of reference, the reference 11 indicates an oil-tight container or tank through the top of which (not shown) bushings 12 are arranged to provide for the protection and insulation of electrical conductors terminating in a pair of fixed or stationary contacts 13. A pair of movable contacts 14 are arranged to bridge the fixed contacts 13 upon movement of a contact-operating rod 16 by the usual contact operating means for such switches which structure is, therefore, not shown or described herein.

Both pairs of contacts, that is, the fixed contacts 13 and the movable contacts 14 are substantially enclosed within chamber 17 when the contacts are in the normally closed or contacting position. An aperture is provided in the bottom portion of the chamber 17 for the purpose of permitting downward movement of the contacts 14 out of bridging relations with the fixed contacts 13. Double cylinders each formed by a large cylinder portion 18 and a small cylinder portion 19 are arranged adjacent the chambers 17, in a vertical direction, and each cylinder portion is connected with its accompanying chamber 17 by conduits 21 and 22. The conduit 21 leads from the larger cylinder portion 18 into the chamber 17 above the fixed contacts 13 and the conduit 22 leads from the smaller cylinder portion 19 into the chamber 17 at a point directly below the fixed contacts 13. Double pistons, including a larger piston portion 23 fitting into the larger cylinder portion 18 and a smaller piston portion 24 fitting into the smaller cylinder portion 19, are maintained under the pressure of a spring 26 arranged within the cylinder portion.

In the structure shown in Fig. 1, the spring 26 is shown as arranged within the larger cylinder portion 18, but it will be understood that the spring may be arranged in either of the cylinder portions as may be desired.

In operation, the contacts 13 and 14 are normally in contact within the chamber 17, and the chamber 17, cylinder portion 19, and conduits 21 and 22 are filled with the oil with which the tank 11 is filled. When contacts 14 are moved downwardly to open the circuit into which the oil switch is connected, the arc produced between the contacts creates a quantity of gases which

collect in the upper portion of the chamber 17, conduit 21 and cylinder portion 23. The expansive force of the gases moves the piston portions 23 and 24 downwardly so that piston 24 creates a pressure in the oil-filled cylinder portion 19 and causes a rapid escape or ejection of the oil from the cylinder 19 into conduit 22, which oil discharges into chamber 17 directly below the fixed contacts 13. The ejected oil is, therefore, thrown through the arc between the contacts and the arc is positively quenched. After quenching of the arc, the gases formed thereby escape from chamber 17 and the spring 26 forces the pistons 23 and 24 to return to the previous position, thereby refilling the cylinder 19 with oil. The entire structure is then in condition for a second disconnecting action and repetition of the operation set forth above.

It will be understood that even though a portion of the gases produced by the arc should enter the smaller cylinder 19, the difference in size of the piston surfaces will provide for a differential action therebetween, so that the piston 23 will cause downward movement of the piston 24 whereby the ejection action of the oil through conduit 22 will be obtained regardless of the presence of gas bubbles in the conduit or in the cylinder connected therewith.

In the embodiment shown in Fig. 2, the above structure is shown as applied to a multi-pole oil switch, each of the contacts of which are provided with separate quenching chambers 17 and separate attendant oil ejection structures as above described. Fig. 3, however, shows an embodiment in which the chambers 17 on each side of the central axis of the switch are combined as a single chamber with a separate oil ejecting structure for each pair of contacts arranged along the side of the quenching chamber. It is apparent that a choice between the structures will be made in response to the structural or operating conditions to be met.

Fig. 4 shows an enlarged view of the oil ejecting structure above described, from which view the relation and construction of the several portions thereof may readily be seen.

Figs. 5, 6 and 7 illustrate modifications of the arc-quenching means which may be employed to meet various structural or operating requirements in an oil switch. In Fig. 5, the cylinder portions 18 and 19 are arranged horizontally and the ejection conduit 22 is brought into the arc-quenching chamber 17 through the side thereof, opposite the larger piston and cylinder opening therinto. In Figs. 6 and 7, the cylinders 18 and 19 are arranged horizontally on opposite sides of the arc-quenching chamber 17 and the rod connecting the two pistons 23 and 24 extends through the arc-quenching chamber. It will be apparent that several ejection conduits may be provided in connection with each of the ejection cylinders and that the conduits may be arranged in such a manner that the oil may be forced through the arc from several directions.

Although but a few embodiments of the present invention have been illustrated and described, it will be apparent that various changes may be made therein without departing from the spirit

of the invention or from the scope of the appended claims.

The invention claimed is:

1. In a device of the character described, a casing containing an insulating fluid, a chamber immersed in said fluid within said casing and having an aperture forming a path for the flow of said fluid therinto and therefrom, a fixed switch contact supported within said chamber, a cooperating switch contact movable through said aperture into and out of connection with said fixed contact to thereby control an electric circuit, a pair of cylinders of different internal diameters each having connection with said chamber providing paths for flow of said fluid thereinto from said chamber and for the flow of said fluid therefrom into said chamber, and interlocked pistons severally arranged within said cylinders and movable responsive to gasification of said fluid within said chamber, upon movement of said cooperating contact from connection with said fixed contact, to cause ejection thereof from one of said cylinders across the path of and transversely to direction of movement of said cooperating contact and out of said chamber by way of said aperture therein to thereby quench the arc established responsive to movement of the cooperating contact from connection with said fixed contact, the said fluid within the casing constituting a source of supply thereof for said chamber and being operative to cool the walls thereof.

2. In a device of the character described, a casing containing an insulating fluid, a chamber immersed in said fluid within said casing and having apertures therein forming paths for the flow of said fluid therinto and therefrom, a plurality of switch contacts fixedly supported within said chamber, a plurality of cooperating switch contacts severally associated with said fixed contacts and movable into and out of connection therewith by way of said apertures, a plurality of pairs of cylinders severally associated with said cooperating contacts, the cylinders of the respective sets thereof being of different internal diameters and each having connection with said chamber forming a passage for the flow of said fluid therinto from said chamber and for the flow of said fluid therefrom into said chamber, interconnected pistons arranged in each set of said cylinders movable responsive to gasification of said fluid within said chamber, upon occurrence of movement of any one of said cooperating contacts from connection with said fixed contact, to cause ejection of said fluid from each of said cylinders having the smaller internal diameter across the paths of and transversely to the direction of movement of said cooperating contacts and out of said chamber by way of said apertures to thereby quench the arcs resulting from movement of said cooperating contacts from connection with said fixed contacts, the said fluid within said casing constituting the source of supply thereof for said chamber and being operative to cool the walls thereof.

ROBERT FISCHLER.