Sept. 29, 1931. O. H. ESCHHOLZ 1,825,311

OIL CIRCUIT BREAKER

Filed Dec. 27, 1922

Fig. 1.

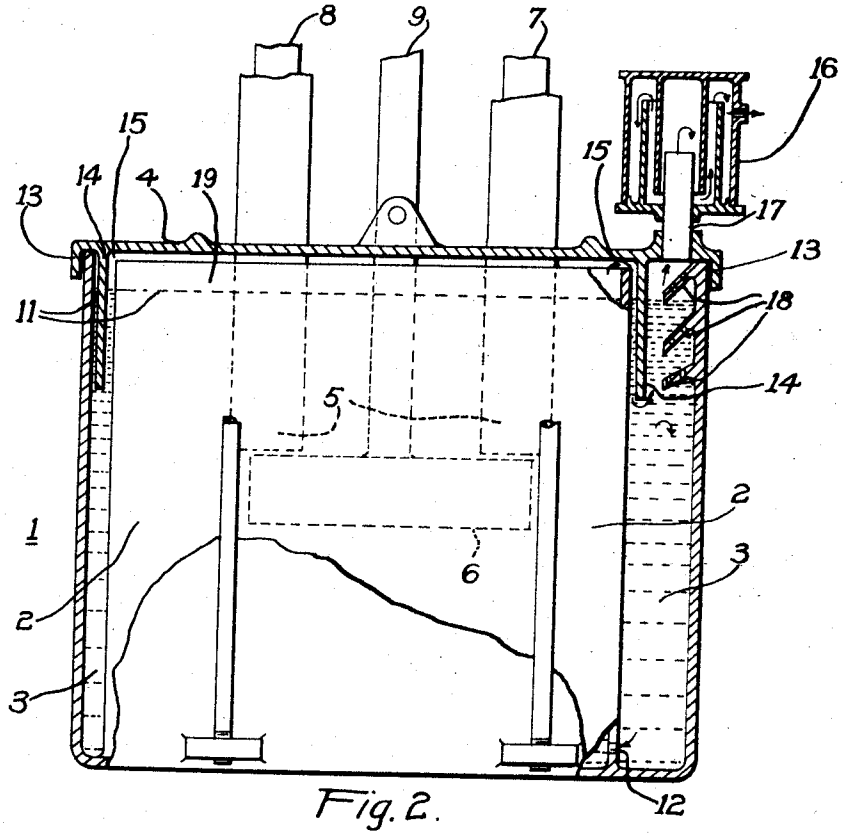
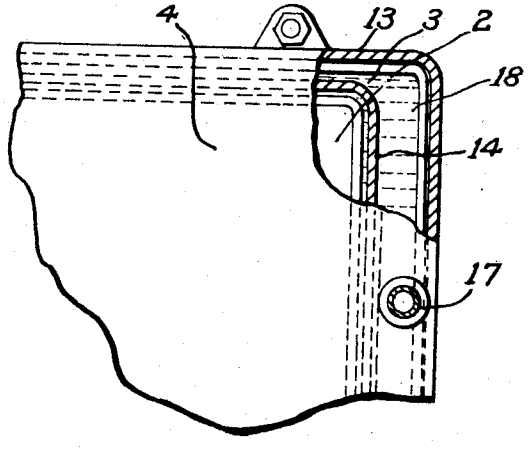


Fig. 2.



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Patented Sept. 29, 1931

1,825,311

UNITED STATES PATENT OFFICE

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OIL CIRCUIT BREAKER

Application filed December 27, 1922. Serial No. 609,171.

My invention relates to circuit interrupters and particularly to those interrupters employing a pair of relatively movable contact members immersed in an insulating fluid.

One object of my invention is to provide an atmosphere of inert gas in contact with the insulating fluid employed in circuit interrupters of this character.

Another object of my invention is to provide a circuit interrupter with means for entrapping portions of the arc gases generated therein for the prevention of the generation of explosive gaseous mixtures upon subsequent operations thereof.

It is a further object of my invention to provide a circuit interrupter with means for excluding the air from contact with the insulating fluid surrounding the contact members, while permitting the escape of arc gases generated at said contact members.

In circuit interrupters, as heretofore constructed, mufflers and baffle plates have been employed to reduce the explosive effect of the arc gases generated between the relatively movable contact members. It has been found in practice that such devices, by themselves, did little to reduce such explosions, since no provision was made for precluding contact of uncombined oxygen with the hot arc gas.

A structure of this general type is shown and described in the United States Letters Patent to G. A. Burnham, No. 1,413,156, granted April 18, 1922, for an electric switch. My invention is an improvement of the structure therein shown and described.

By my invention, I propose to prevent the access of oxygen-bearing gases to such arc gases until the latter have been cooled to a temperature below their ignition point.

Figure 1 illustrates a circuit interrupter, partially in side elevation, and partially in section, embodying the principles of my invention.

Fig. 2 is a plan view of a fragment thereof.

In the preferred embodiment of my invention, I provide a circuit interrupter 1, comprising an inner receptacle or tank 2, and an outer receptacle or tank 3 at least partially surrounding the inner tank 2. A cover 4 fits over both tanks. A pair of relatively movable contact members 5 and 6 is suspended in the tank 2 by electrical conductors 7 and 8 and a control rod 9. These parts may be of any conventional form as they form no part of my invention.

Tanks 2 and 3 are filled with an insulating fluid 11, such as oil, which may, if desired, circulate between the tanks through an opening 12 located near the bottom of tank 2.

Secured to the inner face of cover 4 is a pair of flanges 13 and 14. Flange 13 overhangs the outer surfaces of the tank 3 and forms a close fit therewith. Flange 14 is of greater length than flange 13 and extends into tank 3 a substantial distance below the level of the liquid 11. Flange 14 is not in close contact with the walls of either tank, and a clearance space 15 exists between the top of tank 2 and cover 4. A muffler 16 is shown mounted upon the cover 4 by a connection 17, although a plurality of mufflers may be employed, if desired.

A plurality of perforated baffle plates 18 are secured to an inner wall of tank 3, beneath the muffler 16, and in overlapping relation to the adjacent flange 14. These baffle plates may extend entirely around the inner surface of tank 3, or only a portion of the distance, as is found desirable.

Upon the generation of an electrical arc between the contact members 5, 6, the resultant arc gases cause a violent mechanical splashing of the surrounding fluid, and if there be any free oxygen in the space 19 above the fluid 17 in tank 2, an explosive chemical reaction takes place between the hot arc gases and the oxygen.

This combined action is of enough force to drive the gases from the air space 19, through the opening 15, around the end of the flange 14, and against the baffle plates 18.

A certain amount of the fluid in tank 2 is thrown over into tank 3 with the gases. The baffle plates 18 serve a double purpose as they retard the movement of the fluid

toward the muffler 16, as well as cool the gases which come in contact therewith. In order to pass through the perforations in the baffle plates 18, the large volumes of gas are broken into small units which are more readily cooled. The gases are then liberated to the atmosphere at a temperature below their ignition point.

The muffler 16 serves to check any particles of fluid that are not stopped by the baffle plates 18, and also serves to further reduce the gas temperature.

In the meantime the fluid level between the two tanks has adjusted itself by a circulation of fluid through the opening 12. The fluid level should always remain above the lower extremity of the flange 14, as it then forms a seal against the entrance of air to the tank 2.

Upon the formation of the fluid seal, a certain part of the arc gases is trapped in the space 19. This arc gas, being composed of carbonaceous compounds, hydrogen and nitrogen and having no uncombined oxygen, is an inert gas when brought into contact with subsequent arc gases, and avoids any chemical explosive action. Any pressure, exceeding atmospheric pressure, of the gas in the space 19 may be relieved through the fluid seal, although the latter is effective against atmospheric pressures.

It will thus be seen that I have devised a circuit interrupter which is adapted for employing the arc gases generated therein as inert gas in contact with the insulating fluid upon subsequent operations of the circuit interrupter.

It will be apparent that various modifications may be made in the apparatus without departing from the spirit of the invention, as defined in the accompanying claims.

I claim as my invention:

1. In combination, a receptacle, a fluid in said receptacle, a cover for said receptacle in fixed relation therewith, an electrical device in said receptacle, the fluid in said receptacle insulating said electrical device, a second receptacle at least partially encasing the first named receptacle, a passageway between said receptacles, and means for sealing the passageway against an ingress of gas.

2. In combination, an inner tank, a fluid in said tank, a cover for the tank forming a gas chamber above the liquid, an electrical device immersed in said fluid, an outer tank at least partially encasing said inner tank, a passageway between said tanks, and sealing means in the outer tank for preventing the entrance of gas to the inner tank.

3. In combination, a receptacle, a fluid in said receptacle, a gas chamber above the fluid, an electrical device immersed in said fluid, an outer receptacle at least partially encasing said inner receptacle, a passageway extending from approximately the top of the first named receptacle below the top of the second receptacle, and means for sealing said passageway against the entrance of gas to the gas chamber of the first named receptacle.

4. In combination, an inner receptacle, a fluid in said receptacle, a gas chamber above the fluid, an electrical device immersed in said fluid, an outer receptacle at least partially encasing said inner receptacle, a passageway extending from approximately the top of the inner receptacle below the top of the outer receptacle, and means within said outer receptacle for sealing said passageway against the entrance of gas to the inner chamber.

5. In combination, an inner receptacle, a fluid in said receptacle, a gas chamber above the fluid, an electrical device immersed in said fluid, an outer receptacle at least partially encasing said inner receptacle, a passageway extending from approximately the top of the inner receptacle below the top of the outer receptacle, and means comprising a fluid within said outer receptacle for sealing said passageway against the entrance of gas to the chamber of the inner receptacle.

6. In combination, an inner receptacle, a fluid in said receptacle, a cover in fixed relation with the receptacle forming a gas chamber therewith, an electrical device immersed in said fluid, an outer receptacle at least partially encasing said inner receptacle, a passageway extending from approximately the top of the inner receptacle below the top of the outer receptacle, and means comprising a fluid within said outer receptacle for sealing said passageway against the entrance of gas to the gas chamber of the inner receptacle and a second passageway connecting said receptacles below the level of the fluid.

7. In combination, an inner receptacle, a fluid in said receptacle, a gas chamber in the receptacle above the fluid, an electrical device immersed in said fluid, an outer receptacle at least partially encasing said inner receptacle, a passageway extending from approximately the top of the inner receptacle below the top of the outer receptacle, and means for permitting the escape of the excess arc gases from the gas chamber through said passageway while preventing the entrance of external gas through said passageway.

8. In combination, an inner receptacle, a fluid in said receptacle forming a gas chamber thereabove, an electrical device immersed in said fluid, an outer receptacle at least partially encasing said inner receptacle, a passageway extending from the gas chamber over the top of the inner receptacle below the top of the outer receptacle, and means comprising a liquid seal for permitting the escape of the arc gases generated by said electrical device through said passageway

while preventing the entrance of external gas through said passageway.

9. In combination, an inner receptacle, a fluid in said receptacle, an electrical device immersed in said fluid, an outer receptacle at least partially encasing said inner receptacle, a passageway extending from approximately the top of the inner receptacle below the top of the outer receptacle, means comprising a liquid seal for permitting the escape of the arc gases generated by said electrical device through said passageway while preventing the entrance of external gas through said passageway and means for preventing the expulsion of the fluid from the outer receptacle by said arc gases.

10. In combination, an inner receptacle, a fluid in said receptacle, an electrical device immersed in said fluid, an outer receptacle at least partially encasing said inner receptacle, a passageway extending from approximately the top of the inner receptacle for a distance below the top of the outer receptacle, means comprising a liquid seal for permitting the escape of the arc gases generated by said electrical device through said passageway while preventing the entrance of external gas through said passageway, and means comprising baffle plates for preventing the expulsion of fluid from the second receptacle by said arc gases.

11. In combination, an inner receptacle, a fluid in said receptacle, an electrical device immersed in said fluid, an outer receptacle at least partially encasing said inner receptacle, a passageway extending from approximately the top of the inner receptacle for a distance below the top of the outer receptacle, means comprising a liquid seal for permitting the escape of the arc gases generated by said electrical device through said passageway while preventing the entrance of external gas through said passageway, and means comprising a muffler for preventing the expulsion of the fluid from the outer receptacle by said arc gases.

12. In combination, an inner receptacle, a fluid in said receptacle, an electrical device immersed in said fluid, an outer receptacle at least partially encasing said inner receptacle, a passageway extending from approximately the top of the inner receptacle for a distance below the top of the outer receptacle, means comprising a liquid seal for permitting the escape of the arc gases generated by said electrical device through said passageway while preventing the entrance of external gas through said passageway and means comprising a muffler and baffle plates for preventing the expulsion of the fluid from the outer receptacle by said arc gases.

13. In combination, the combination with an inner receptacle, a fluid in said receptacle, an electrical device immersed in said fluid, an outer receptacle at least partially encasing said inner receptacle, and a passageway extending from approximately the top of the inner receptacle for a distance below the top of the outer receptacle, of means for securing an inert gas above the fluid in said inner receptacle.

14. In combination, the combination with an inner receptacle, a fluid in said receptacle, an electrical device immersed in said fluid, an outer receptacle at least partially encasing said inner receptacle, and a passageway extending from approximately the top of the inner receptacle for a distance below the top of the outer receptacle, of means for securing above the fluid in said inner receptacle an inert gas generated in said inner receptacle upon a prior operation of the electrical device.

15. A liquid container for submerged electrical apparatus, a cover for the container forming a gas chamber above the liquid, an annular space about the container filled with the liquid, an annular flange projecting from the cover immersed in the liquid to such a depth that the atmospheric pressure is not sufficient to force air into the chamber.

16. In combination with an electrical apparatus having an enclosing casing subject to temperature variation while in use and in which gas is generated during use, a passageway from the interior to the exterior of said casing which includes a liquid seal of such depth as to prevent said temperature variation from producing an ingress of air but to permit egress of at least a portion of said generated gases.

17. In combination with a circuit interrupter having an enclosing casing subject to temperature variation while in use and in which gas is generated during use, a passageway from the interior to the exterior of said casing which includes a liquid seal of such depth as to prevent said temperature variation from producing an ingress of air but to permit egress of at least a portion of said generated gases.

In testimony whereof, I have hereunto subscribed my name this 8th day of December, 1922.

OTTO H. ESCHHOLZ.