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CIRCUIT BREAKER

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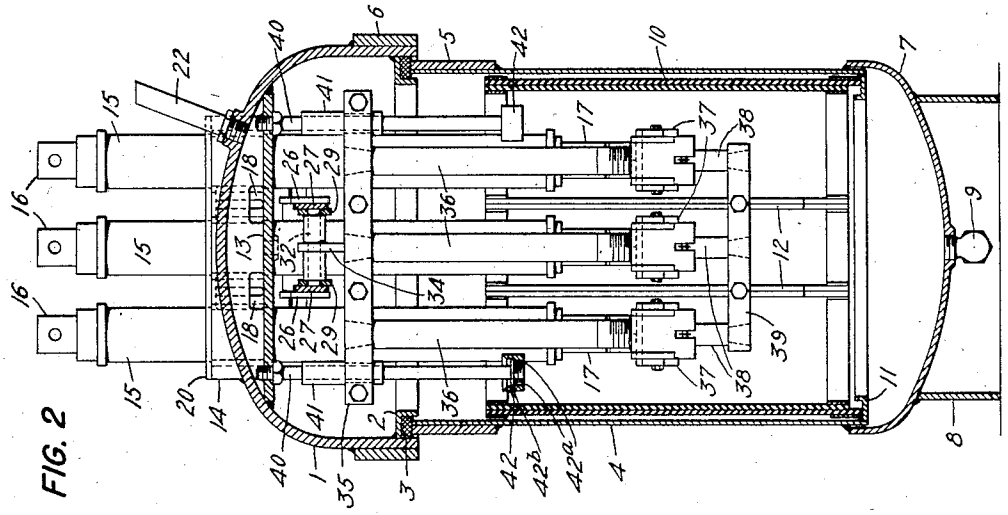


FIG. 2

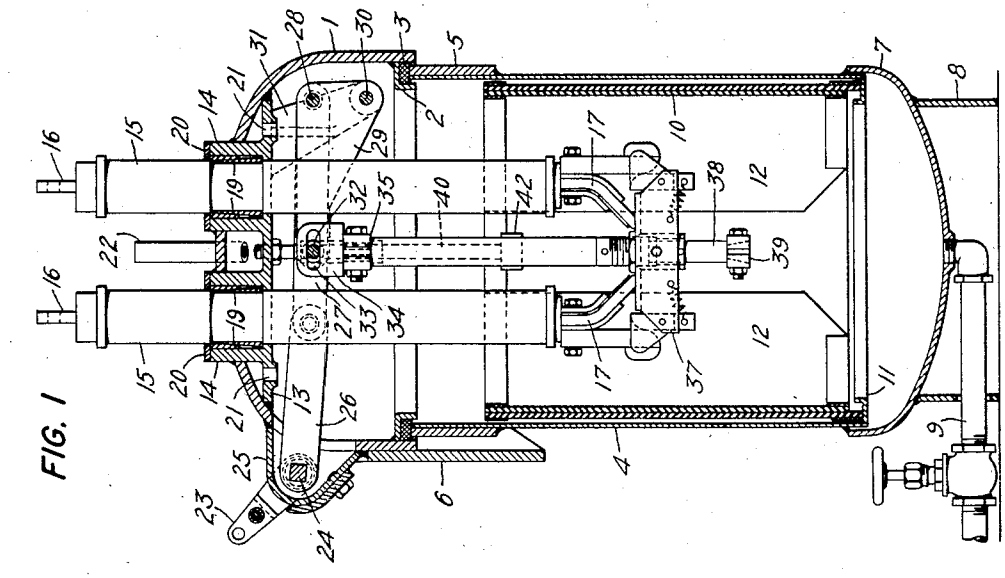


FIG. 1

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CIRCUIT BREAKER

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10 Claims. (Cl. 200—150)

This invention particularly relates to circuit breakers wherein the parts are enclosed within a tank containing oil within which the making and breaking of the circuit occurs. When the breaking of the circuit occurs during the passage of an abnormally large current, such as caused by a short circuit, the oil is violently forced in all directions and its vaporization greatly increases the pressure within the tank.

Objects of the present invention are to provide a form of construction of the parts and relationship that will withstand the high pressures without breakage or distortion, prevent the oil from escaping from the tank in any undue amount and likewise permit the release of the high pressures accompanying a rupture of heavy currents. Another object is to provide means for conveniently supporting the parts within the enclosing tank. Another object is to avoid objectionable heating by eddy currents of the top portion of the tank where the main leads enter. Another object is to provide a simple and rugged form of construction that will be dependable with long continued use. Other objects and advantages will be understood from the following description and accompanying drawing.

Figure 1 is a vertical central section of a circuit breaker embodying the invention; and Fig. 2 is a vertical central section at right angles to that of Fig. 1.

The upper part of the tank comprises a dome shaped bumped head 1 and is shown having welded thereto on its inner surface at its lower open end, an angular circular ring 2 forming a circular recess which receives the gasket 3. The lower main portion of the tank is made up of a steel cylinder 4, the upper end of which is adapted to engage the gasket 3 and is bolted to the upper element 1 by bolts passing through lugs welded to the reinforcing circular plate 5 which in turn is welded to the tank element 4. Corresponding lugs are welded to the reinforcing plate 6 which embraces the lower portion of the dome 1 and is welded thereto. These lugs and bolts for holding the two parts of the tank together are not shown in the drawing as they are not in alignment with the views shown, and any suitable form of clamping and holding means may be used. The lower end of the tank is closed by a steel dome shaped head 7 which envelopes the lower end of the tank 4 and is welded thereto. A circular sheet steel support 8 is welded to the dome 7 to form a supporting base for the tank when standing. A drain pipe 9 connects with the center of the dome 7. The lower part of the tank is lined with a cylindrical insulating element 10 supported on a steel ring 11 welded to the interior end of the element 4. From the insulating cylinder 10 extends opposed partitions 12 of insulating material which extend between the arcing points of the contacts of the breaker.

Inserted within the head 1 and in the upper part thereof is a casting 13 which has a base portion in the form of a horizontally extending circular plate, the periphery of which engages the interior of the head 1 and is welded thereto at its outer edge or periphery. This plate thus closes off the upper space of the dome from the lower portion of the breaker and forms a baffle plate against the force of the oil upon rupture of an abnormal current. Upwardly extending from the plate 13 of the casting are a series of hollow cylinders 14 in two rows of three each for a three-phase circuit breaker. These cylinders are open at the outer and inner ends for receiving and supporting the insulators 15 which contain the conductors 16 and support the fixed contacts 17 at the lower ends thereof. The cylindrical portions 14 of the casting are arranged in two rows of three each, each row of three being joined together at their upper portions by a continuous wall of the casting and having openings 18 at lower intermediate portions. The walls of the two rows of the supporting cylinders 14 extend upwardly through appropriately formed openings in the dome head 1 and are welded to the dome head on the outside thereof along their engaging parts, as indicated in the drawing. The welding of the casting 13 to the inside of the dome and the welding thereof to the outside of the dome, as just described, gives an entirely closed upper portion of great strength and rigidity, each part reinforcing the other. Packing 19 is placed between the insulators 15 and the cylinders 14 to hold the insulators firmly in place and a ring 20 encloses each set of three insulators and is bolted to the top portions of the cylinders 14 for retaining the parts in place. A pair of openings 21 of comparatively small size are formed in the plate portion of the element 13 at diametrically opposite points; and at right angles thereto a vent pipe 22 of comparatively small size passes through the dome 1 connecting with the space between the dome and the plate element 13. Thus when a short circuit causes the opening of the breaker, the only passage for the splashing oil and relief for the high pressure within the tank is through the openings 21 to the space above the plate 13 and then around the outer portions of this plate to the vent pipe 22. Thus a relief for the high

pressure within the tank is afforded while the oil is effectively retained within the tank.

Another feature of the baffle plate and supporting casting 13 is that by making the same of non-magnetic material, such as nickel steel with the known proper proportion of nickel, or of non-magnetic cast iron, the induction of objectionable eddy currents is avoided with the consequent avoidance of undue heating arising therefrom. This baffle plate casting also avoids any objectionable induction of eddy currents in the dome 1 by reason of cylinders 14 materially spacing all portions of the dome from the insulators.

The baffle plate casting 13 serves the additional function of conveniently supporting and guiding the lever operating mechanism of the breaker. The breaker is operated, either manually or automatically, in any of the well known ways by rotation of the lever 23, the inner end of which is secured to the outer end of a horizontal shaft 24. This shaft is housed within an auxiliary housing 25 which is welded to the dome 1 of the breaker and extends outwardly at one end of the housing 25 to receive the lever 23. A square interior portion of the shaft 24 carries a pair of links 26 which in turn are pivotally connected to a pair of links 27 which in turn are pivotally connected at 28 to the upper ends of a pair of bell-crank levers 29 which latter are pivotally supported upon a fixed rod 30 supported by a pair of arms 31 depending from and preferably integral with the baffle plate 13. These links and levers thus form an efficient toggle mechanism for greatly increasing the pressure in closing the contacts of the breaker. The inwardly projecting ends of the levers 29 carry a cross-pin 32 which passes through a horizontal slot 33 in a central plate 34. This plate is secured at its lower end to a cross-bar 35 which is made up of two outside clamping plates bolted together to hold between them the depending rods 36 of insulating material, such as wood, which in turn hold and support the movable contact elements 37 at their lower ends. Below the contacts extend insulating rods 38 which are clamped together at their lower ends by a cross-piece 39 for reinforcing and steadying the movement of the movable contacts, particularly against the magnetic repulsion when carrying large currents.

The baffle element 13 also serves as a support for the guiding rods 40 which are fixed to the plate 13 at diametrically opposite locations near the drum head 1. These depending rods pass through sleeves 41 which are clamped within the cross-piece 35. The lower ends of the rods 40 have enlarged portions 42 which serve as stops for the movable contacts in their lowest open circuit position. The guide rods 40 are located outside the rods 36 and serve to maintain the cross-piece 35 and the movable contacts in proper alignment at all times.

The stops 42 have cup-shaped recesses in their upper part into which the lower portion of the guide rod sleeves 41 fit. This portion of the guide rod assembly is under oil and forms an oil dash pot to cushion the opening stroke of the breaker at the last portion of its stroke and relieve the parts from the shock of a sudden stopping of the parts. One of the stops 42 is shown in section in Fig. 2 and is shown as a cup-shaped piece outwardly flared within and screwed on to the lower end of the rod 40. It has vertical holes 42^a normally covered by a vertically movable flat ring 42^b. In the opening or downward movement of the breaker, the lower ends of the sleeves 41 enter the cup-shaped stops 42 comparatively slowly, giving the cushioning effect. In closing the breaker, the parts can move freely out of the stops 42, the rings 42^b moving upwardly somewhat to permit free inflow of oil through the passages 42^a in the upward closing movement of the parts.

Although a particular embodiment of this invention has been described, it will be understood that various modifications may be made thereof without departing from the scope of the invention.

I claim:

1. An oil circuit breaker comprising an enclosing tank, said tank having a dome-shaped head, and a baffle element fitted within the dome-shaped portion of the head and secured to said dome-shaped portion of the head at the outer edge of said element forming an enclosed space between said element and the top of the tank, said element having an opening connecting said space with the interior of the tank and said head having a venting opening connecting said space with the exterior of the tank.

2. An oil circuit breaker comprising an enclosing tank, said tank having a dome-shaped head, a baffle element fitted within and secured to said dome-shaped head at the outer edge of said element, and insulators for the conducting leads of the breaker supported by said baffle element.

3. An oil circuit breaker comprising an enclosing tank, said tank having a dome-shaped head, a horizontally extending baffle element fitted within and secured to said dome-shaped head at the outer edge of said element, said baffle element having vertically extending portions, and insulators for the conducting leads of the breaker supported by said portions.

4. An oil circuit breaker comprising an enclosing tank, a horizontally extending baffle element within the top portion of the tank, said baffle element having vertically extending portions extending through the top of the tank, and insulators for the conducting leads of the breaker supported by said portions.

5. An oil circuit breaker comprising an enclosing tank, said tank having a dome-shaped head, a horizontally extending baffle element fitted within and secured to said dome-shaped head at the outer edge of said element, said baffle element having vertically extending portions extending outwardly through said head, and insulators for the conducting leads of the breaker supported by said portions, said portions being of non-magnetic material.

6. An oil circuit breaker comprising an enclosing tank, a horizontally extending baffle element within the top portion of the tank, said baffle element having vertically extending portions extending through the top of the tank, and insulators for the conducting leads of the breaker supported by said portions, said portions being of non-magnetic material.

7. An oil circuit breaker comprising an enclosing tank, a horizontally extending baffle element within the top portion of the tank, said baffle element having vertically extending portions extending through the top of the tank, insulators for the conducting leads of the breaker supported by said portions, said portions being of non-magnetic material, operating mechanism supported from the underside of said baffle element, and guiding rods for said mechanism depending from said baffle element.

8. An oil circuit breaker comprising an enclosing tank, mechanism within the tank for moving the parts to closed and open position, fixed guid-

ing rods for said mechanism, and cushioning means carried by said guide rods.

9. An oil circuit breaker comprising an enclosing mechanism within the tank for moving the parts to closed and open position, a fixed guiding rod for said mechanism, said rod depending from the top portion of said tank and having its lower end immersed in the oil, and a dash pot on the lower end of said rod.

10. An oil circuit breaker comprising an enclosing tank, a baffle element within the top portion of the tank, operating mechanism supported from the under side of said baffle element, guiding rods for said mechanism depending from said baffle element and having their lower ends immersed in the oil, and dash pots on the lower ends of said rods.

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