

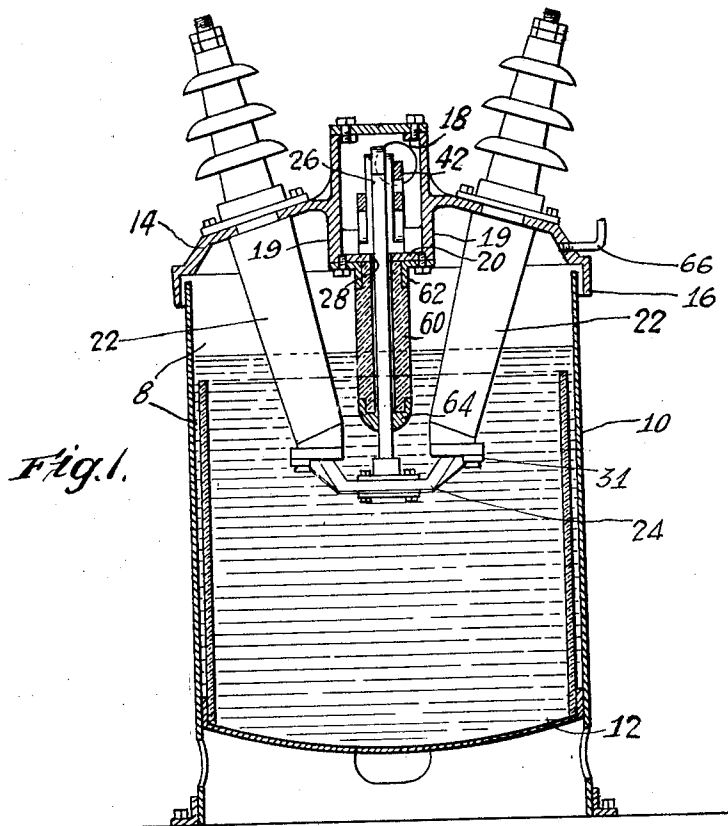
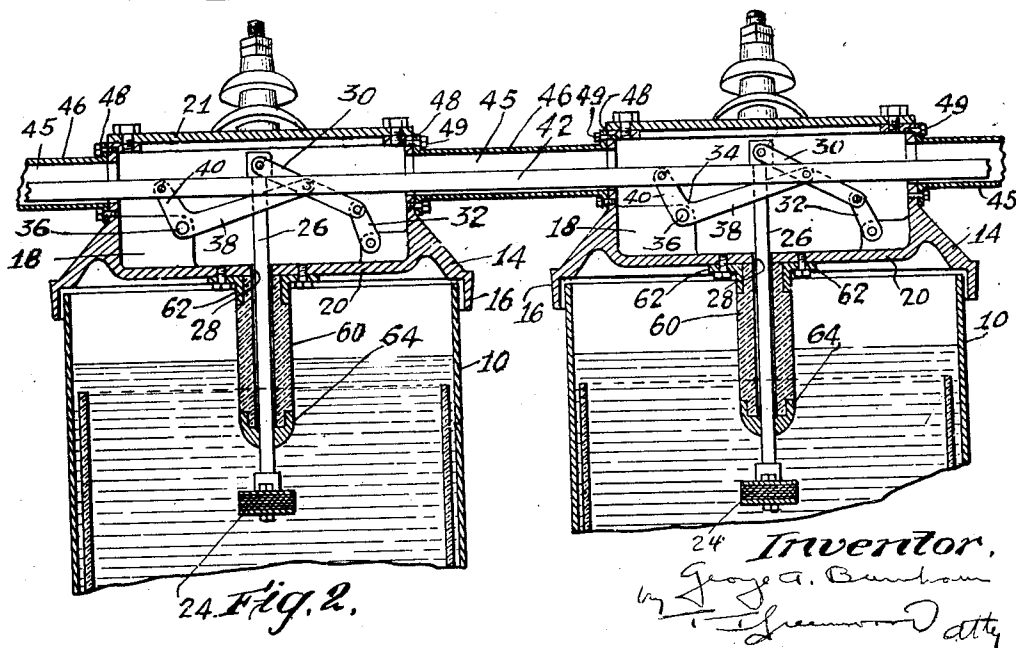
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HEAVY DUTY ELECTRIC SWITCH

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UNITED STATES PATENT OFFICE

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HEAVY-DUTY ELECTRIC SWITCH

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This invention relates to oil immersed electric switches adapted for interrupting heavy currents at high voltages; and more particularly to heavy duty oil switches having separate enclosing casings for each phase and a common actuating mechanism.

In the switch embodying this invention, the switch operating mechanism for each phase unit, is disposed within an enclosed mechanism compartment or well, between which wells communicating passages are provided to accommodate the mechanism rods by which the several units are operated conjointly. Under certain conditions of circuit interruption oil is thrown about in the switch casing and into the mechanism well, from which it may escape or may pass to adjacent switches of the set. A combustible mixture may also be formed in the gas expansion space above the oil which mixture under proper conditions, may burn or explode.

An object of this invention is to isolate the mechanism well from the gas expansion space of the switch, whereby to keep the oil and combustible mixture, or explosive pressures, out of the mechanism well and to isolate from each other the oil compartments of the switches of a multi-phase switching set.

A further object is generally to improve the construction and performance of oil circuit breakers.

Fig. 1 is a sectional elevation of an electric switch embodying the invention.

Fig. 2 is a detailed sectional elevation of two adjacent switch units of a multi-phase switching set embodying the invention.

As here shown, the electric switch embodying this invention is adapted to control a multi-phase electric circuit and to this end is provided with several separate units, each comprising a switch casing and cooperating stationary and movable switch members. Said units are or may be identical and consequently the description of but one unit will suffice. Each phase unit includes the enclosing casing 8 which is adapted to contain oil or other suitable arc quenching fluid. Said casing comprises a vertical cylindrical shell 10 of substantial height open at both ends, forming the side walls of said casing, and

the concave plate 12 which is secured by means of rivets or by welding in fluid tight relation within said shell near its lower end to provide a bottom closure for the casing.

A switch frame 14 is secured to the top of said casing and forms a top-closure therefore and has a peripheral flange 16 which depends over the top of the side wall of the casing. Said switch frame is provided with an enclosed mechanism compartment or well 18 of more or less rectangular shape which is disposed in the intermediate portion thereof and is formed by the parallel side walls 19 which extend both above and below the top wall of the switch frame. The mechanism well is closed at the bottom by the integral bottom wall 20 and at the top by the removable well-cover 21.

Stationary switch members 22 are carried by said switch frame on opposite sides of the mechanism well and extend into the interior of the switch casing and into the oil therein contained. The movable switch member includes a bridging or brush member 24 which is adapted to be raised and lowered into and away from circuit-controlling relation with the lower ends of said stationary switch members. Said brush member is carried at the lower end of an insulating switch rod 26 which is extended upwardly and through an aperture 28 in the bottom wall 20 and into said mechanism well and is connected with the switch operating mechanism therein contained. Said operating mechanism may be of any usual or suitable construction which, preferably is adapted to guide the switch rod for movement in a straight line. As here shown, the mechanism includes a guide link 30 one end of which is pivotally connected with said switch rod at the upper end thereof and the other end of which is pivoted to the upper end of a strut-link 32, the lower end of which latter link is pivotally connected with the switch frame. A bell-crank lever 34 is pivoted at 36 to the switch frame on the opposite side of said switch rod; and the end of the long arm 38 of said lever is pivotally connected with an intermediate point on said guide-link. The short arm 40 of said bell-crank lever is pivoted to an actuating rod 42

which is adapted to be moved in a substantially horizontal direction by switch actuating mechanism (not shown) whereby to raise and lower said operating rod and said brush members and thereby to close and open the switches.

The mechanism wells of the several switch units are arranged to be connected by communicating passages 45 through which said actuating rod 42 is adapted to pass, by which the movable switch members of the several units are caused to be raised and lowered in unison. Said passages may be constructed of pipe-sections 46 which may have flanges 48 at each end whereby they may be secured to the mechanism wells of the several switch units in a fluid tight manner by means of bolts 49.

In accordance with this invention, means are provided to isolate the mechanism well from the oil and gas space of the switch casing, whereby to keep the oil and the switch gases out of the mechanism well and also to isolate the casings of the various switch units of a multi-phase switching set. To this end, an insulating tubular member 60 is disposed to loosely surround the switch rod 26. The upper end of said member 60 is fixed in a flange 62 which is secured in a fluid tight manner to the bottom wall of the mechanism well about the switch-rod opening therein. The lower end of said tubular member is extended beneath the level of the oil in the casing and is terminated at about the level of the brush member 24 and the lower ends of the stationary switch members 22 in a metal nose 64 which functions as a guide for the switch rod. Said tubular member and its fittings are connected together in a substantially fluid tight manner so that a fluid tight conduit for the switch rod is provided which extends from the mechanism well to a point below the oil level in the casing. While the lower open end of said conduit which forms the opening for the mechanism well, is freely open, or at least there is a free running clearance between the switch rod and the inner wall of the conduit, gas from the gas-expansion space above the oil in the casing cannot enter the mechanism well because of the body of oil about the lower end of the conduit. No appreciable amount of oil can enter the mechanism well through the conduit because of the small clearance space about the switch rod, and the resistance to fluid flow offered by the small clearance. The gases in the gas expansion space above the oil can escape through the vent 66.

I claim:

1. An electric switch having an oil containing enclosing casing which has a gas space above the oil and a mechanism well in the gas space which has an opening in its bottom but is otherwise sealed from the interior of the casing, means providing

an oil seal for said opening, whereby to prevent access of gas into said well from the interior of said casing, and means independent of said well to vent the gas space of said casing.

2. An electric switch having an enclosing casing adapted to contain oil and having a gas expansion space above the oil, and a mechanism well disposed mainly in said gas expansion space above the oil and isolated from fluid communication therewith, said well having an opening in the bottom which is beneath the oil, said casing having a venting passage which is independent of said mechanism well.

3. A multi-phase switch apparatus comprising a plurality of switch casings each adapted to contain oil and gas expansion spaces above the oil, intercommunicating mechanism wells carried by said casings, and having switch-rod openings in the bottoms thereof, and means to isolate said wells from fluid communication with the gas expansion spaces of said casings including means to provide oil seals for said openings, said wells thus being sealed from communication with the gas spaces of said casings, and said casings having venting passages for the gas spaces independent of said wells.

4. A multi-phase switching apparatus comprising a plurality of switch casings each adapted to contain oil and having gas expansion spaces above the oil, intercommunicating mechanism wells carried by said casings mainly above the oil and isolated from said gas expansion spaces, said mechanism wells having openings in the bottoms thereof which are beneath the oil in said casings, said wells thus being sealed from communication with the gas spaces of said casings, and said casings having venting passages for the gas spaces independent of said wells.

5. An electric switch having an enclosing casing adapted to contain oil, a mechanism well disposed entirely above the oil level and isolated from the interior of said oil containing casing, said mechanism well having a hollow extension depending into and terminated beneath the level of the oil, and a switch rod operable in said extension said casing having a venting passage which is independent of said well.

6. An electric switch comprising the combination of an oil containing enclosing casing, stationary and movable switch members depending into the oil of said casing, a mechanism well carried by the upper part of said casing, switch operating mechanism contained therein including a rod which depends through an aperture in the bottom of said well and supports said movable switch member at its lower end, and an insulating tube fixed dependently to said mechanism well in surrounding relation with said rod and

terminated at the lower ends of said stationary switch members and constituting a guide for said rod thereat, whereby to guide said brush member into engagement with said stationary switch members.

5 7. An electric switch having an enclosing casing adapted to contain oil and provided with a gas expansion space above the oil, a mechanism well disposed above the oil level
10 and sealed against gaseous communication with said expansion space, a switch rod depending from said well into the oil, and a tubular guide member surrounding said switch rod and having its upper end in gas
15 tight connection with said well and depending from said well through the gas expansion space and into the oil in said casing, the lower end of said tubular guide member being open only beneath the oil, and the side
20 wall thereof being imperforate.

8. An electric switch comprising an enclosing casing adapted to contain oil and having a gas expansion space above said oil, an enclosed mechanism well disposed entirely
25 above the oil and isolated from the gas expansion space, switch operating mechanism disposed within said well and having an operative element extending through an opening in the bottom of said mechanism well
30 and through the gas expansion space into the oil of said casing, and means to prevent the entrance of gas from said gas expansion space to said mechanism well through said opening comprising a depending casing for
35 said operative element and surrounding said opening and having a fluid tight connection with said well and extended downwardly through said gas expansion space and terminated only below the level of the oil within
40 said casing, the side wall of said depending casing being imperforate in said gas expansion space.

9. In an electric switch, the combination of a pair of enclosing casings adapted to contain oil and gas expansion spaces above the
45 oil, an enclosed mechanism well contained in the top of each of said casings entirely above the oil therein, means providing a communicating passage extending between said mechanism wells, switch operating rods extending through openings in the bottom walls
50 of said mechanism wells, and means to isolate said mechanism wells from the gas expansion spaces in said casings, said insulating means including guide tubes for said operating rods, the upper ends of which tubes surround the openings in the bottom walls of said wells and are secured to said walls in a gas tight manner and the lower ends
60 of which open only into the oil in said casings.

10. An electric switch having an enclosing casing adapted to contain oil and a gas expansion space above the oil, a mechanism well
65 disposed in the upper part of said casing

above the oil therein and having a bottom wall which is located above the oil and has an opening therethrough, switch operating mechanism contained in said well including a switch rod which extends through said
70 opening into the oil, and an insulating tube having an imperforate side wall loosely surrounding said switch rod and having a flanged upper end which surrounds said opening and is carried by and has a substantially gas tight connection with the bottom
75 wall of said well and which has a metal rod guiding member at its lower end which is submerged in the oil of the casing.

11. An electric switch having an enclosing casing adapted to contain oil, a mechanism well disposed above the oil and isolated from communication with the interior of the casing and having a bottom wall which is located above the oil and has an opening
80 therein, and a tube fixed to and having a substantially gas-tight connection with said bottom wall about said opening and extended downwardly therefrom and having its lower open end terminated only beneath the level
85 and sealed by the oil in said casing.

In testimony whereof, I have signed my name to this specification.

GEORGE A. BURNHAM.

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