Nov. 17, 1964 J. R. McCLOUD 3,157,769

BAFFLE STRUCTURE FOR OIL CIRCUIT BREAKER TANK

Filed April 6, 1962 2 Sheets-Sheet 1

FIG. 2.

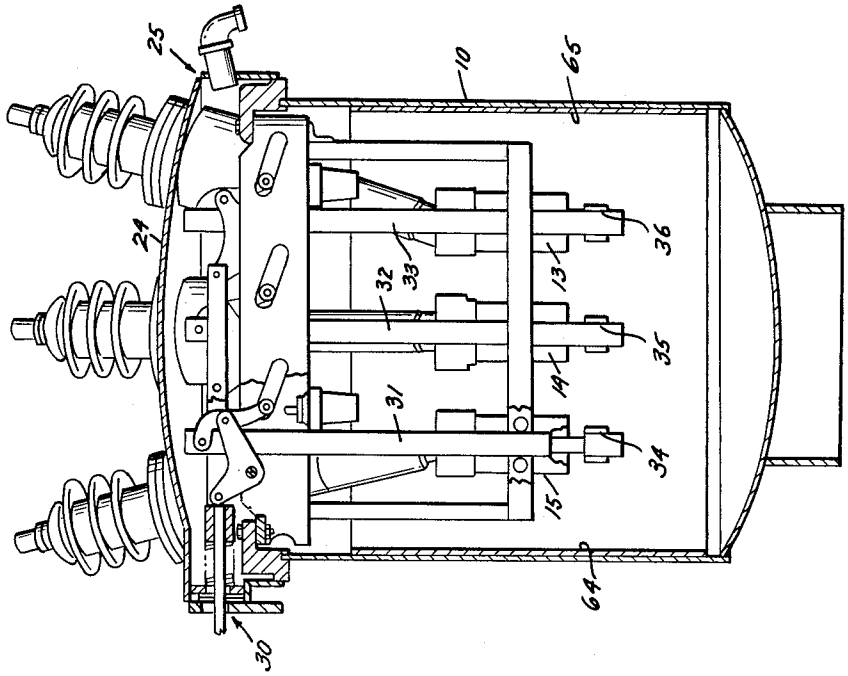
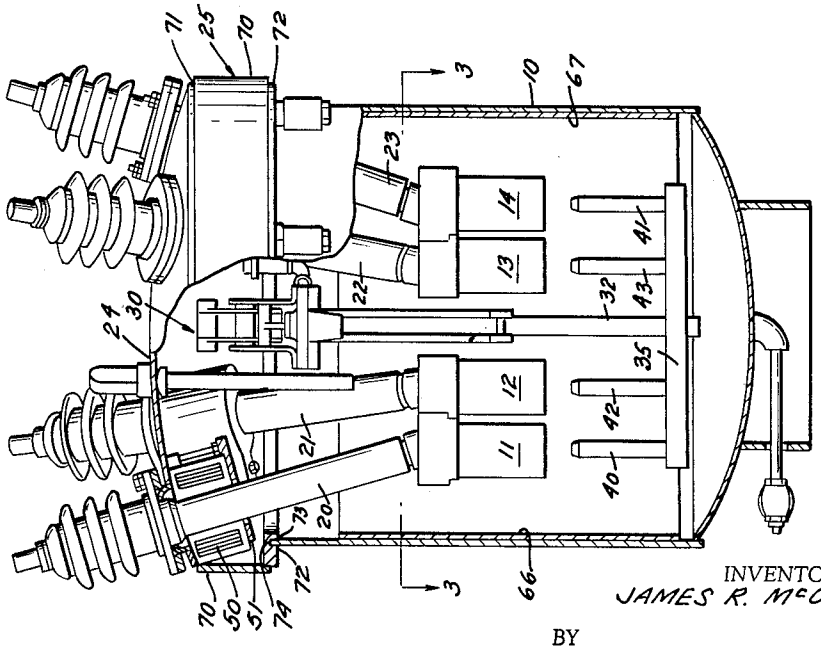


FIG. 1.



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FIG. 3

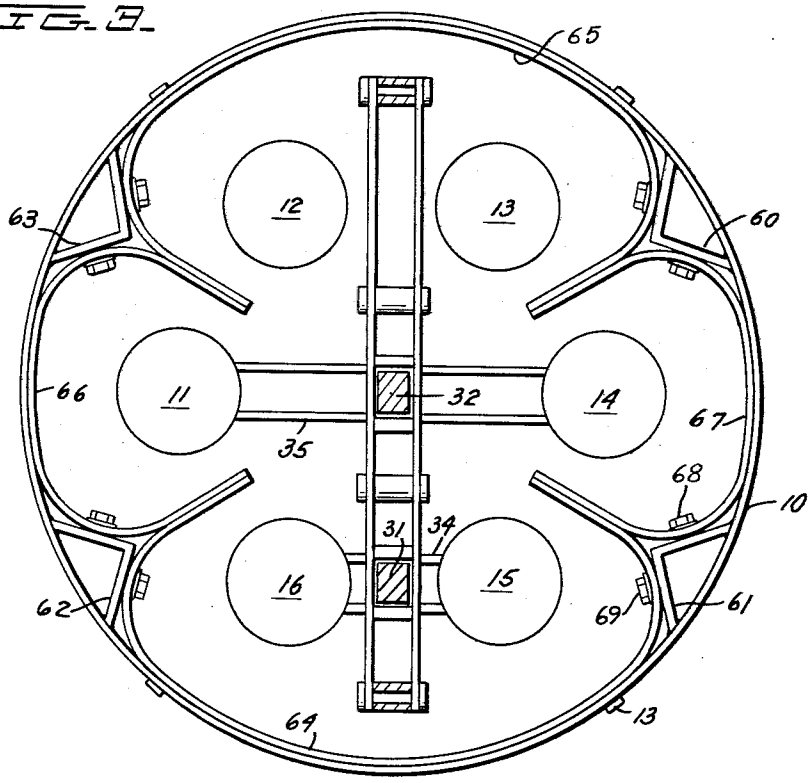
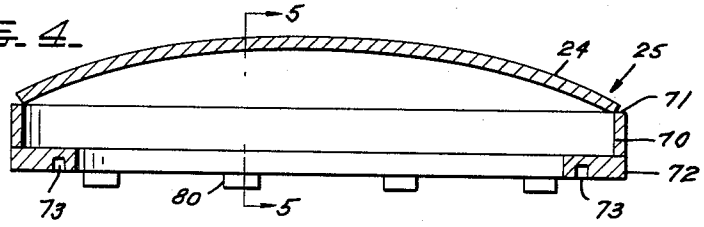


FIG. 4



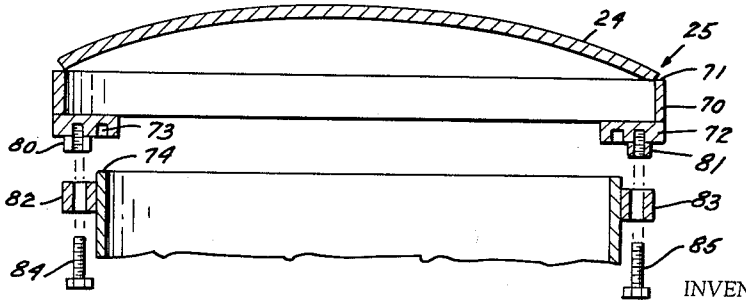


FIG. 5

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BAFFLE STRUCTURE FOR OIL CIRCUIT BREAKER TANK

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Filed Apr. 6, 1962, Ser. No. 185,685
3 Claims. (Cl. 200—150)

My invention relates to a novel construction for oil circuit breakers which permits the formation of an inexpensive, highly reliable system which could operate at ratings of the order of 14.4 kilovolts at 500 mva.

The invention more specifically is comprised of a plurality of novel features which cooperate with one another in the formation of a desirable unitary device, but any of the features could be used alone.

The first feature of the novel invention is the provision of a novel liner for the interior of the oil circuit breaker tank. Liners of this type are shown in my copending application Serial No. 67,125, filed November 3, 1960, entitled "Three Phase Oil Circuit Breaker" and assigned to the assignee of the instant invention, wherein the liners were dropped into the tank with four liner sections appropriately bolted to one another so that they have extending portions which extend between adjacent interrupters within a common tank.

In accordance with the present invention, the liners are not secured to one another, but are secured to a novel angle member contained in the tank wall which gives the liners superior rigidity at their free edges, and securely positions the liners within the tank.

Thus, one object of the present invention is to provide a novel improved liner construction for oil circuit breaker tanks.

A further object of the invention is to provide a novel construction for oil circuit breaker tanks wherein the free edges of insulation barriers between interrupters in a common tank are held securely.

A further feature of the invention is in the formation of the head of the top frame assembly. Generally, oil circuit breakers of the type to which the invention applies are formed of a main tank body which contains a dielectric medium such as oil and which receives a top frame assembly which carries the interrupters to be contained within the oil filled tank. The top frame assembly has a spherically shaped head portion which receives insulator bushings and through which insulator bushings pass.

It has been thought necessary in the past that this spherical head have a relatively short radius. Because of this, current transformers which seat beneath the head and around the bushings which pass through the head must be provided with special support structures, since the current transformers will not sit flush against the head portion and are not tangent to the head portion. For example, it has been necessary to "bump" or flatten the spherical head portions adjacent the insulation bushing supports and current transformers to make them tangent to the bushing mounting flange.

In accordance with the present invention, the spherical head is made to have a relatively large radius of the order of 48 inches, whereby the head will have a sufficiently flat surface to receive current transformers without the requirement of additional relatively expensive support structure. That is, the radius is such that it is tangent to the mounting flange of the entrance bushing. This makes the long axis of the bushing at 90° to the head, creating an area suitable to seat the transformer.

Moreover, this relatively large diameter head portion is made of a separate section which can be secured to a ring assembly. An identical ring assembly may then be

provided with a head of selected material, depending upon the current rating of the unit.

By way of example, the spherical head may be of stainless steel where high current ratings of the order of 1200 amperes are to be used, whereby the stainless steel will have a sufficiently high resistivity to limit eddy currents to prevent excessive heating.

At lower current ratings of the order of 600 amperes, however, where eddy current heating is less severe, a head of identical configuration can be used, but of normal steel material. Thus, the material of the head is chosen in resistivity in accordance with the current rating of the unit.

Accordingly, a further object of this invention is to provide a novel head portion for the top frame assembly which is exchangeable with other head portions of different materials, depending upon the current rating of the unit.

Another object of this invention is to utilize a high resistivity material for the head of the top frame assembly to reduce eddy current losses.

A further object of this invention is to simplify the current transformer support on the head of the top frame assembly for current transformers carried by the bushings entering the top frame assembly.

A further object of this invention is to simplify current transformer supports for oil circuit breakers by providing a large radius head portion for the top frame assembly which is tangent to the mounting flange of the entrance bushing.

As pointed out above, the oil circuit breaker is usually formed of a lower tank portion and a top frame assembly which is received by the tank with the top frame assembly carrying the interrupters. It is generally necessary that the tank can be removed from the top frame assembly so that the interrupters may be inspected. To this end, the top frame assembly is provided with a lower ring which has an annular groove therein which receives a gasketing material. The upper rim of the tank then seats within this ring, and the two sections must be clamped together.

I have found a novel manner for forming this clamping arrangement wherein a lower ring secured to the top frame assembly is provided with threaded bosses disposed around the periphery of the ring. These bosses are exposed externally of the diameter of the annular groove which receives the top of the tank. The tank is then provided with appropriate lugs which are in cooperating position with the bosses secured to the lower ring of the top frame assembly. Thus, a tank bolt inserted from beneath the lug can be easily passed through the tank bolt lug and into engagement with the tank bolt boss on the top frame assembly.

Accordingly, a further object of this invention is to provide a novel method of clamping the top frame assembly to the tank of an oil circuit breaker.

These and other objects of my invention will become apparent from the following description when taken in connection with the drawings, in which:

FIGURE 1 shows a plan view of the interrupters carried from the top frame assembly of an oil circuit breaker with the tank of the circuit breaker cut away to show the inner portions thereof.

FIGURE 2 is a plan view of the oil circuit breaker of FIGURE 1 when seen from an angle 90° displaced from the angle of FIGURE 1.

FIGURE 3 is a cross-sectional view of FIGURE 1 taken across the lines 3—3 in FIGURE 1 to illustrate the tank liners and insulation barriers between interrupters.

FIGURE 4 is a side cross-sectional view through the top frame assembly to illustrate the interchangeable top plate of the top frame assembly.

FIGURE 5 is a side cross-sectional view of FIGURE 4 when taken across the lines 5—5 in FIGURE 4, and further shows in exploded view the top of the tank to illustrate the novel clamping means of the invention.

Referring now to FIGURES 1 and 2, I have illustrated therein a typical oil circuit breaker assembly which contains the novel features of the invention. In many respects, the oil circuit breaker assembly of FIGURES 1 and 2 is similar to that of my copending application Serial No. 67,125 "Three Phase Oil Circuit Breaker," and reference is made thereto for several details of construction which need not be given here.

Generally, in FIGURES 1 and 2, I have shown an oil circuit breaker tank 10 which will be filled with oil and which receives six interrupters 11 through 16 (FIGURE 3) which correspond to two series connected interrupters for each phase of a three-phase system. Interrupters of the type which could be used in FIGURES 1 and 2 are shown, for example, in copending applications Serial No. 2,390, now Patent No. 3,128,360, issued April 7, 1964; Serial Number 2,530, now abandoned; and Serial No. 88,349, and need not be described in detail here. FIGURE 1 shows four of the six interrupters as interrupters 11, 12, 13 and 14. Interrupters 13 and 14 are also seen in FIGURE 2 along with a fifth interrupter 15.

It will be noted that interrupters 11 and 14 are connected in series with a first phase, interrupters 12 and 13 are in series with a second phase, and interrupters 15 and 16 correspond to a third phase.

Each of the interrupters are carried by an appropriate insulator bushing such as bushings 20, 21, 22 and 23 in FIGURE 1 which have interrupters 11, 12, 13 and 14 at the lower ends thereof. The bushings extend through openings in the top plate 24 of the top frame 25, and are mechanically carried by the top frame assembly 25.

The system is operated from an operating mechanism which could be of the type shown in copending application Serial No. 157,352, filed December 6, 1961, entitled "Motor Operated Spring Mechanism," in the name of James R. McCloud, and assigned to the assignee of the present invention, with an appropriate system of linkages 30 which could be of the type shown in copending application Serial No. 67,125, being connected to the three lift rods 31, 32 and 33 of FIGURE 2. The lift rods are provided with appropriate guide structures which are also fully described in copending application Serial No. 67,125, and terminate with respective crossbars 34, 35 and 36 (FIGURES 2 and 3) which carry bayonet-type contacts at their opposite ends.

Thus, crossbar 35 carried bayonet contacts 40 and 41 which are connected in series through crossbar 35 and cooperate with stationary contacts contained at the top of interrupters 11 and 14 respectively. In a similar manner, bayonet contacts 42 and 43 of FIGURE 1 cooperate with interrupter chambers 12 and 13, while similar bayonet contacts such as the bayonet contact 14 on crossbar 34 in FIGURE 2 cooperates with interrupter chamber 15, and its associated chamber 16 of FIGURE 3.

The operating mechanism 30 of FIGURES 1 and 2 is such that it can move the crossbars 31, 32 and 33 upwardly and downwardly to bring the bayonet contacts into and out of engagement with their respective interrupters, whereby the three phases of a three-phase line can be connected or disconnected in the usual manner.

It is often necessary in such systems that the bushings carry current transformers to measure the phase current when the circuit breaker is closed. To this end, and in FIGURE 1, it is seen that bushing 20 has a current transformer 50 thereon which is supported between the bottom of top plate 24 and a bracket 51 which is also carried from top plate 24 by studs from plate 24.

In the past, it has been necessary to flatten the portion of the top plate which is adjacent the current transformer location so that the current transformer can be appropriately secured in position. In accordance with the present

invention, however, I form the top plate 24 of a sufficiently large diameter so that the area receiving the top of current transformer 50 and the other current transformers of the remaining bushings will be sufficiently flat to inherently serve as a tangent support surface. Thus, the support structure for the current transformer is considerably simplified, and the cost of the unit is decreased.

As a further feature of the invention, and as is discussed in copending application Serial No. 67,125, it is desirable that the insulation barriers extend between the adjacent interrupters to prevent an expanding gas bubble generated during operation of the interrupters from connecting two adjacent interrupters whereby a phase-to-phase failure may occur.

In accordance with the present invention, and as is best seen in FIGURE 3, the inner walls of tank 10 are provided with angles 60, 61, 62 and 63 which are welded to the tank walls of tank 10. Elongated fiber liners 64, 65, 66 and 67 are then bolted to the angles, as illustrated by bolts 68 and 69 for angle 61, whereby the free ends of the liners formed in the cloverleaf pattern of FIGURE 3 extend between the interrupters of adjacent phases.

Accordingly, this novel construction permits secure bolting between the tank wall and the liners, which gives the liners great rigidity at their free edges. Moreover, it eliminates the need for passing bolts through the tank wall for receiving the liners, as has been the practice in the past.

The invention further provides simplicity in the formation of the top frame assembly 25. More specifically, and referring to FIGURES 4 and 5, the top frame assembly is formed of the top plate 24 previously described as having a relatively large radius and a ring 70 which is welded to the top plate 24 along the seam 71. The ring 70 then receives a lower plate 72 having an annular groove 73 therein which, as seen in FIGURE 5, receives the upper end 74 of tank wall 10. Clearly, an appropriate gasketing ring (not shown) will be contained within groove 73 to provide a tight seal between the top frame assembly 25 and the tank 10.

I have discovered that the resistivity of top plate 24 should be relatively high for applications wherein the rated current is of the order of 1200 amperes, since eddy currents in a relatively low resistivity top plate at these relatively high currents can cause excessive heating. When, however, the current rating is decreased, the eddy currents can be largely ignored. However, the same physical size unit may be used within a wide range of currents so that a unitary top frame assembly would require a large inventory where different resistivity materials are to be used, depending upon the rating of the unit.

In accordance with the present invention, the top plate 24 is a component part of the top frame assembly, and it would only be necessary to stock the same top plate 24 in different materials with the remainder of the top frame assembly being the same.

Accordingly, in current applications of the order of 1200 amperes, the top plate 24 will be made of stainless steel which has a higher resistivity than normal steel, while it can be of normal steel where the current rating is of the order of 600 amperes.

As a further feature of the invention, and as is specifically illustrated in FIGURE 5, I have provided a novel means for securing the top frame assembly to the tank which eliminates the previous need for a rolled ring, but permits the casting of a common lower ring 73. More specifically, and as illustrated in FIGURE 5, the lower ring 73 is provided with a plurality of bosses such as bosses 80 and 81 of FIGURE 5 where, for example, eight bosses are placed around the lower edge of ring 73. These bosses are cast in such a position as to align with tank bolt lugs such as lugs 82 and 83 which are welded to the upper end of tank wall 10, and register with the various bosses around the lower surface of ring 73.

In order to secure tank 10 to the top frame assembly 25, it is only necessary to bring the tank 10 upwardly so that its end 74 engages groove 73, whereupon the tank

bolt lugs align with tank bolt bosses. Tank bolts such as bolts 84 and 85 can then be threaded into the tapped opening within the bosses so that the tank 10 is securely fastened to top frame assembly 25.

Although I have described preferred embodiments of my novel invention, many variations and modifications will now be obvious to those skilled in the art, and I prefer, therefore, to be limited not by the specific disclosure herein but only by the appended claims.

I claim:

1. In an oil circuit breaker; a tank containing oil, a plurality of interrupter structures supported within said tank, a plurality of insulation sheets interposed between adjacent interrupters of said plurality of interrupters, and a support means for supporting said plurality of insulation sheets; said support means comprising angle members secured to the interior surface of said tank and extending parallel to the axis of said tank; said angle members having their apex facing toward the center of said tank; each of said plurality of said sheets having a portion thereof extending along the interior of said tank and having an intermediate portion of said sheet secured to one face of a respective angle member; the remaining portion of each

of said insulation sheets extending from its said respective angle member and toward the interior of said tank.

2. The device substantially as set forth in claim 1 wherein six interrupters define said plurality of interrupters; each of said six interrupters having axes parallel to the axis of said tank; said six interrupters being arranged to form three pairs of series connected devices.

3. The device substantially as set forth in claim 2 wherein said plurality of insulation sheets comprises four adjacent insulation sheets defining at least four extending sections; said at least four extending sections extending between adjacent interrupters of different pairs of said pairs of interrupters.

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