Nov. 27, 1928.

1,693,265

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CASING FOR ELECTRICAL APPARATUS

Original Filed June 25, 1924 2 Sheets-Sheet 1

Fig. 1.

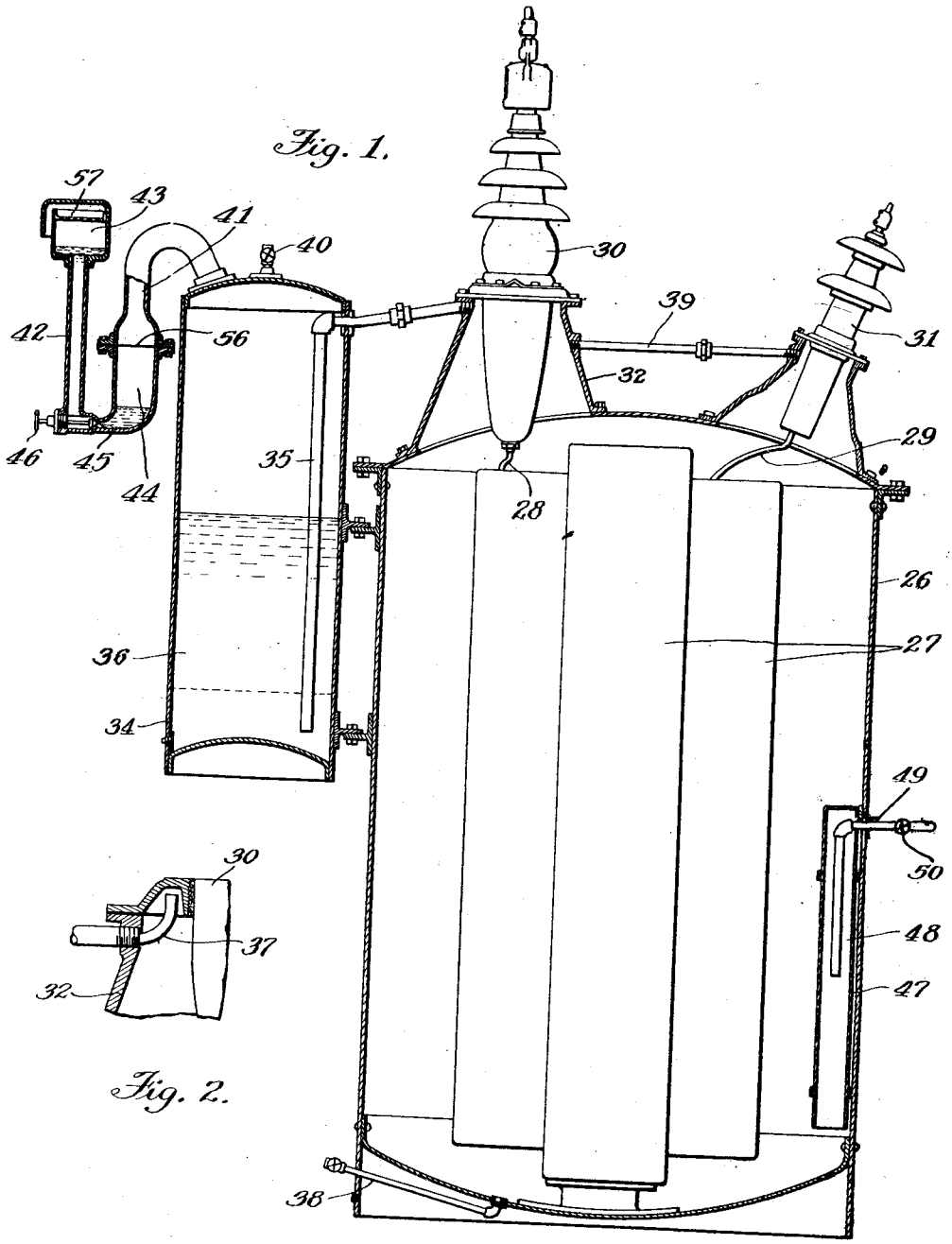


Fig. 2.

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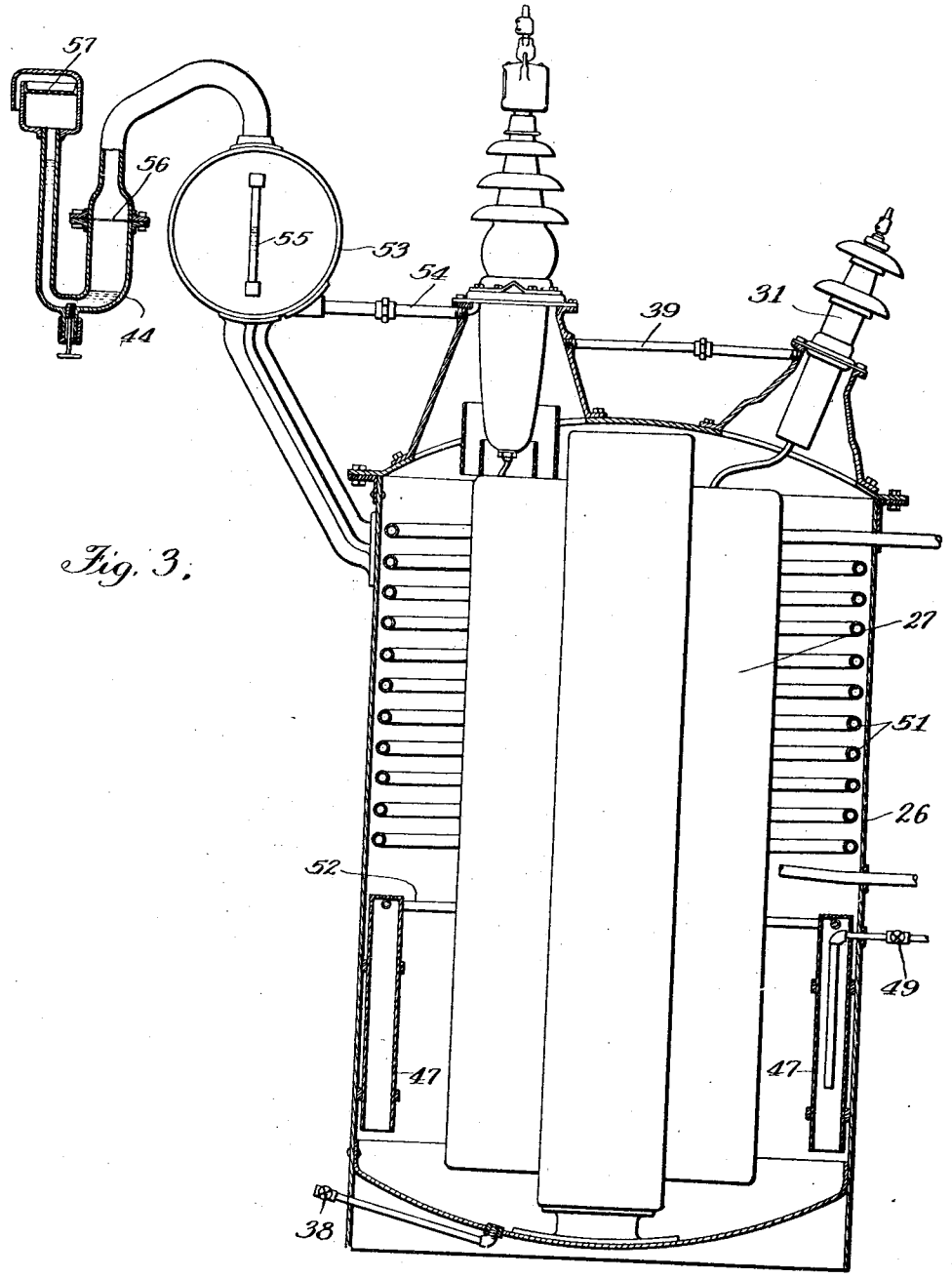


Fig. 3.

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Patented Nov. 27, 1928. 1,693,265

UNITED STATES PATENT OFFICE.

ARTHUR O. AUSTIN, OF BARBERTON, OHIO, ASSIGNOR, BY MESNE ASSIGNMENTS, TO THE OHIO BRASS COMPANY, OF MANSFIELD, OHIO, A CORPORATION OF NEW JERSEY.

CASING FOR ELECTRICAL APPARATUS.

Original application filed June 25, 1924, Serial No 722,204. Divided and this application filed November 20, 1925. Serial No. 70,220.

This invention relates to improvements in oil containing cases or tanks used for transformers, circuit breakers, oil switches, electrostatic condensers or other electrical apparatus where the dielectric strength of oil is an important factor in determining the size and reliability of the apparatus.

The object of the invention is to provide a casing of the class named in which there shall be improved electrical and mechanical characteristics and in which oil will be protected from contamination without endangering the apparatus or casing.

The invention is exemplified in the combination and arrangement of parts shown in the accompanying drawings and described in the following specification, and it is more particularly pointed out in the appended claims.

This is a division of application, Serial No. 722,204, filed June 25, 1924.

In the drawings—

Fig. 1 is a vertical section showing the application of the invention to a condenser housing;

Fig. 2 is a detail section; and

Fig. 3 is a view similar to Fig. 1 showing another form of the invention.

It is a well-known fact that the oil level in transformers or other electrical apparatus rises with an increase in temperature and falls with a lowering of temperature. If the air space above the oil is connected to the outside air, a breathing action takes place which draws in fresh air as the oil level falls. In many localities this air may contain a considerable percentage of moisture, some of which may be taken up by the oil, reducing its dielectric strength very materially in the course of time.

This is particularly true where the temperature of the oil is at or below the temperature of the air at some time. This condition is likely to prevail in cases where the apparatus is idle or where there is little or no heat generated, as in the case of electrostatic condensers and oil circuit breakers. To remove this difficulty, a new type of tank or case has been provided. This case has several distinct advantages.

In Fig. 1 there is shown a transformer housing 26 having transformer windings 27 connected to leads 28 and 29. The leads are carried out through bushings 30 and 31, respectively, the bushings being supported on pedestals 32 and 33 mounted on top of the housing 26. The pedestals 32 and 33 provide chambers surrounding the lower end of the bushings and communicated with the interior of the housing. A sealed tank 34 is supported at one side of the housing 26 and is connected by pipe 35 to the upper portion of the space within the pedestal 32. The tank 34 is partly filled with oil or other insulating compound 36 and the pipe 35 opens near the bottom of the tank. The upper end of the pipe 35 is provided with a goose neck 37 which opens at the top of the space within the pedestal 32. The housing 26 is filled with oil through a connection 38 at its lower end so that during filling the air within the housing will be forced out through the pipe 35 permitting the oil to completely fill the space around the lower end of bushing 30. Pipe 39 connects the interiors of the pedestals 32 and 33 so that during filling of the housing the air will be forced from the pedestal 33 through the connection 39 into the pedestal 32 and then out through the pipe 35. The oil 36 forms a seal for the housing 26 so that the oil will be maintained in the pedestals 32 and 33. The interior of the system may be placed under any desired pressure through a valve 40 at the top of the tank 34. A safety U-tube 41 is connected with the top of the tank 34 and the pressure within the tank 34 is balanced by a column of liquid 42, the upper surface of which is open to atmosphere within an enlarged cup 43 at the top of the column. The leg 44 of the U-tube has a considerably greater diameter than the column 42 to permit considerable range of pressure without greatly raising the surface of the sealing liquid 42 about the bottom of the U-tube. When excessive pressure occurs in the housing 26, such as may be produced by overheating, short circuits or other causes, the liquid in the leg 44 will be forced down to the bottom of the U-tube, thus permitting the escape of a sufficient amount of air to relieve the pressure in the system. The orifice 45 through which the air escapes is controlled by a valve 46 and is, preferably, comparatively small so that the air will escape through the leg 42 without raising the

entire column of liquid within the leg. The cup 43, however, has sufficient capacity to retain the liquid so that after the pressure has been relieved, the safety U-tube will automatically restore itself because of the difference in the size of the legs of the U seal, the seal offers less resistance to ingress than it does to egress of air.

In many installations the windings do not conform to the contour of the transformer housings. Where this is the case, advantage may be taken of the extra space within the housing for a compression tank such as that shown at 47. This tank is open at its lower end and provides a pocket 48 in its upper portion for air or gas. A pipe 49 is provided having a valve 50 through which the pressure in the tank 47 will be controlled. This compression chamber 48 will provide additional facility for expansion and contraction of the oil in the housing 26. At the same time it will effect an economy of oil since it occupies space which it would otherwise be necessary to fill with the insulating oil.

The form of compression tank shown at 47 has especial advantages in connection with casings for circuit breakers, high potential switches and other apparatus which may produce an arc within the housing. The compression tank has its open end in direct communication with the body of the liquid in the housing so that any pressure shock is immediately communicated to the air or gas in the top of the compression tank without any appreciable time lag such as is present with the ordinary form of conservator tank or other relief device connected with the housing through a pipe or through a restricted passage. A further advantage is that since the open end of the compression tank is near the bottom of the housing, there is practically no danger of any gas produced in the housing by an arc or other cause, entering the compression tank and forming an explosive mixture in the compression space. Any gas generated in the housing will rise to the top of the housing where it may be permitted to escape through any suitable relief device such as the trap 44. The compression tank 47 will thus compensate for variations of pressure between limits and will also relieve sudden pressure shocks and give the blow-off device time to operate to permit the escape of gas produced simultaneously with the shock and thus restore normal pressure within the housing. If the gas produced is of an explosive nature or such that it would form an explosive mixture with the gas in the compression chamber, it is prevented from endangering the housing because the generated gas is allowed to escape without entering the compression chamber.

In Fig. 3 there is shown a construction similar to that of Fig. 1. In this instance, however, the transformer housing is shown as provided with cooling coils 51 and a plurality of compression tanks 47 are provided below these coils. These tanks are connected at their tops by pipe 52. The compression tank 53 in this instance is raised above the top level of the oil in the housing and is connected with the interior of the housing by means of a conduit 54. The tank 53 may be a horizontally extending cylinder partially filled with oil, as indicated by the gauge glass 55. This will maintain a liquid head on the housing 26 which may be augmented by gas or air pressure in the top of the tank 53. A U-tube seal or trap 44 similar to that in Fig. 1 seals the tank 53 to atmosphere and provides a safety blow-out to take care of pressure too great to be taken care of by the resiliency of the gas in the tank 52. In the U-tubes in both instances porous diaphragms 56 and 57 are provided of suitable material, such as chamois skin or other substance that will permit passage of air but prevent overflow of the liquid.

I claim:—

1. A housing for electrical apparatus having two conductor bushings extending through the top thereof, supports for said bushings providing chambers surrounding the interior portions thereof, means for connecting said chambers to permit the passage of air from one to the other, a vent communicating with the top of one of said chambers, and a liquid seal for said vent.

2. In combination with a housing for electrical apparatus, of a bushing extending through the top of said housing, a pedestal carried by said housing for supporting said bushing and forming a chamber about the inner portion of said bushing, an expansion tank having liquid in the lower portion thereof and a gas space in the upper portion thereof, the surface level of the liquid in said tank being below the top of said chamber, means for supplying liquid to said housing, and a conduit communication with the upper portion of said chamber and opening below the liquid in said tank.

3. The combination with a housing for electrical apparatus, of means for forming a compression chamber in communication with the interior of said housing to permit expansion and contraction of liquid in said housing, and a U-tube seal for said compression chamber, said seal having one leg thereof connected with said compression chamber and of greater cross-sectional area than the other leg thereof.

4. The combination with a housing for electrical apparatus, of means forming a compression chamber communicated with the interior of said housing to permit expansion and contraction of liquid within said housing, and a U-tube seal for said chamber, said seal having a restricted orifice near the bottom thereof to control the escape of gas through the liquid of said seal.

5. The combination with a housing for electrical apparatus having insulating liquid therein, of means disposed within said housing below the surface of said liquid for providing a gas pocket to facilitate expansion and contraction of said liquid said pocket being open at its bottom and closed at its top.

6. The combination with a housing for electrical apparatus arranged to contain an insulating liquid, of a compression chamber communicating with the interior of said housing, and a U-tube seal for said compression chamber, said U-tube seal having one leg of larger diameter than the other and connected with said compression chamber, the other leg of said U-tube being open to the atmosphere and having an enlarged cup for preventing overflow of liquid from said U-tube.

7. The combination with a housing for electrical apparatus, of a compression chamber communicating with said housing, and a liquid seal for said compression chamber, said liquid seal comprising a U-tube having one leg connected with said compression chamber and the other leg communicating with the atmosphere, there being a restriction for limiting the rate of escape of gas through said U-tube.

8. The combination with a housing for electrical apparatus, of a pedestal extending upwardly from said housing, an insulator bushing extending through said pedestal and closing the top thereof, a compression tank having a chamber separate from said housing, a conduit connecting said chamber with the upper part of the interior of said pedestal, and a U-tube seal connected with said chamber.

9. The combination with a housing for electrical apparatus, of a compression chamber connected with said housing, a U-tube seal for said compression chamber, said seal having one leg connected with said chamber and the other leg open to atmosphere, and a baffle pervious to gas but impervious to liquid for preventing entrance of the liquid from said seal into said chamber.

10. The combination with a housing for electrical apparatus having insulating liquid therein, of a compression tank closed at its top and open at its bottom and having a pocket of gas entrapped therein, said compression tank having its lower open end positioned near the bottom of said housing.

11. The combination with a housing for electrical apparatus having insulating fluid therein, of a compression tank disposed entirely within said housing below the surface level of the liquid in said housing, said tank being closed at its top for retaining a pocket of gas, the lower portion of said tank having free communication with the liquid in said housing at a point below the major portion of the electrical apparatus in said housing.

12. The combination with a housing for electrical apparatus of a trap connecting said housing with atmosphere, said trap comprising a liquid seal having legs of different cross sectional areas through which gas passes to and from said housing when the pressure within said housing differs from the pressure outside of said housing by predetermined amounts, the leg adjacent said housing having a greater sectional area than the leg communicating with the atmosphere to permit escape of gas from said housing through said legs at a less pressure difference than that at which gas enters said housing through said legs.

In testimony whereof I have signed my name to this specification on this 11th day of November, A. D. 1925.

ARTHUR O. AUSTIN.