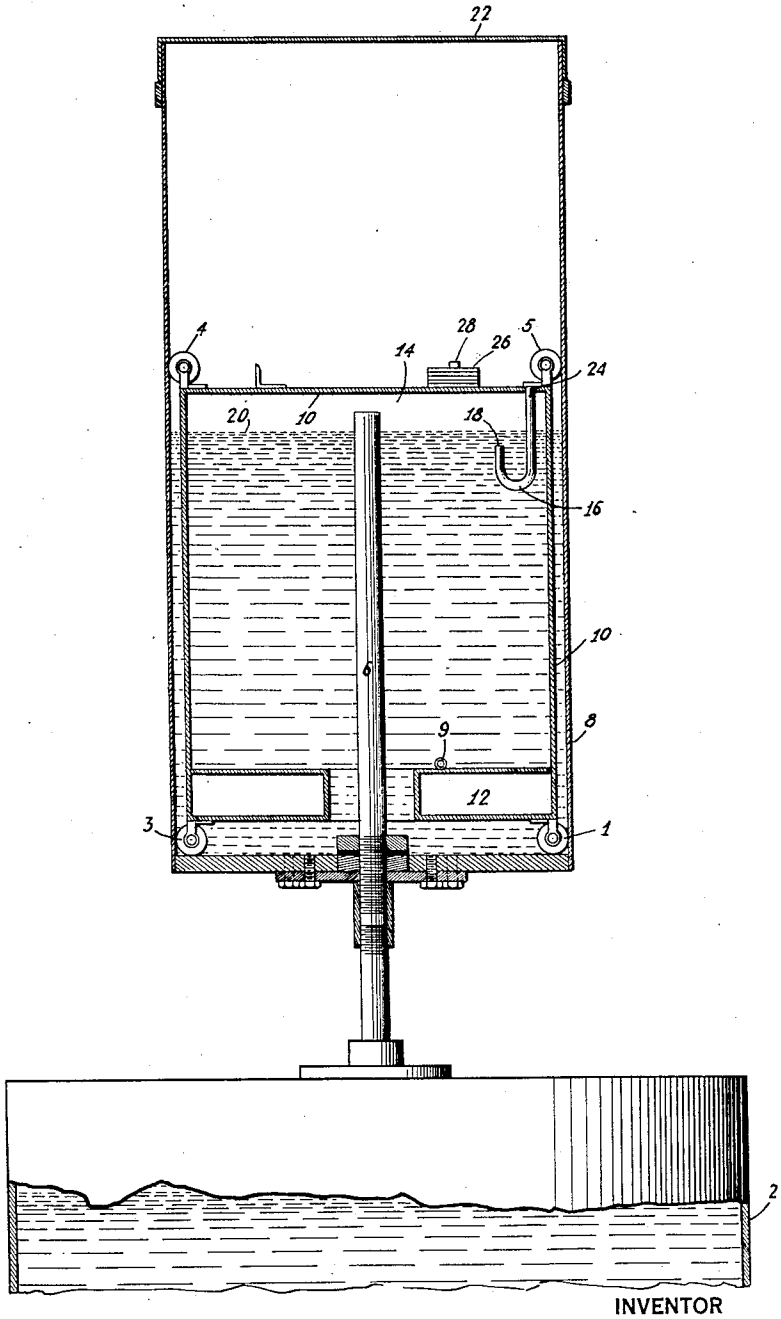
March 24, 1936. L. L. YOUNG 2,034,736

TRANSFORMER BREATHER

Filed June 4, 1931




INVENTOR
LLOYD L. YOUNG
BY H. G. Grover
ATTORNEY

Patented Mar. 24, 1936

2,034,736

# UNITED STATES PATENT OFFICE

2,034,736

## TRANSFORMER BREATHER

Lloyd L. Young, Rocky Point, N. Y., assignor to Radio Corporation of America, a corporation of Delaware

Application June 4, 1931, Serial No. 542,087

7 Claims. (Cl. 220—85)

This invention relates to the oil filled transformer or reactor art and has as an object the provision of a non-humidifying transformer breather.

Heretofore, it has been the practice to allow the space above the insulating oil, for example, in a transformer tank, to breathe through a simple opening into the atmosphere as the transformer became heated due to the flow of currents therein. Consequently, the continual inhalation and exhalation of air introduced moisture and foreign substances into the oil, causing lowered insulating qualities which, of course, necessitated frequent renewal of the oil.

A further object of my present invention is to eliminate these frequent oil renewals and the concomitant cost of operation and maintenance of such an arrangement by maintaining the oil dry while allowing the necessary transformer breathing.

To do so, it is an object of my present invention to provide an arrangement wherein the reactor tank may breathe into an expansive chamber having no communication with the atmosphere, except at certain times, as will be explained more fully hereinafter.

More specifically, it is an object of my invention to provide a breathing arrangement comprising an hermetically sealed transformer tank filled with oil over which there is placed an expansive chamber having an inverted cylinder or bell shaped member. The space above the transformer tank is then brought into fluid communication with the under surface of the bell shaped member whereby expansion of the transformer oil and the air above the transformer insulating liquid causes the bell to play up and down in the oil partially contained within the expansive chamber.

In order to prevent excessive movement of the bell within the casing of the expansive chamber, it is a further object of this invention to provide means, preferably in the form of a vent, which shall bring the under surface of the bell or floating cylinder member facing the oil within the casing of the expansive chamber into communication with the atmosphere. As the times of such excessive movements are rare, there is only a very slight possibility of contamination of the oil within the transformer tank, which it is desired to maintain uncontaminated, with impurities such as moisture and dirt normally present in the atmosphere.

As the oil in the transformer tank cools and the bell within the casing of the expansive chamber moves to its original position, after it has moved to an extreme position such that air was forced through the vent to the atmosphere, there is a possibility that a partial vacuum may exist underneath the bell. To overcome the presence of a partial vacuum under such circumstances is a further object of my present invention and to do so I provide an inverted tube which admits air to the under surface of the bell in the event of the creation of a partial vacuum.

A further object of my present invention is to provide means for guiding the bell in its movement up and down within the casing whereby binding is prevented.

Although my present invention is described more fully with the aid of the accompanying drawing illustrating a breathing arrangement for a transformer tank in accordance with my present invention, it is to be clearly understood that my invention is not limited to the illustration shown, for, it may be applied equally as well to other systems requiring similar apparatus.

Referring to the drawing, the air or gas above the liquid or oil in transformer tank **2** is brought into communication with the expansive chamber or casing **8** through the medium of a connecting pipe or other suitable means **6** to the under surface of the cylinder or floating bell shaped member **10**.

The floating bell **10** is contained within a cylindrical casing **8** in turn containing oil or other liquid up to the level **20**, and hermetically sealed more or less as found desirable by the cover **22** to keep out dust and all foreign matter but not absolutely hermetically sealed as it is necessary for the proper operation of this apparatus that the space in container **8** should freely communicate with the atmosphere under the edges of the cover **22** so that there shall not be destructive pressures established within the casing **8** of the expansive chamber by the expansion of materials inside of the container **2**. This will permit the bell **10** to rise high enough so that vent **9** will then become operable.

To assist in buoying the bell shaped member in the oil contained within casing **8**, an enclosed air tight compartment or buoying tank **12** is suitably fastened to the base of the bell shaped member **10** as a result of which the weight of the member **10** may be neutralized or balanced to any desired extent.

Now, due to heating of the transformer coils, the oil and air in tank **2** will expand creating a pressure through pipe **6** into the expansive chamber between the under surface of the bell and the

upper surface of the oil level 20 of the oil within casing 8. Conversely as the transformer coils cool, the air is forced back into the upper portion of transformer tank 2.

To prevent too great a movement of the bell shaped member 10 within casing 8, a vent hole 9 in the side wall of bell 10 is provided. Excessive expansion in the transformer tank cannot cause disruptive pressure in the breathing apparatus due to the vent hole 9. This vent hole 9 functions to bring the under surface of the bell into communication with the atmosphere or to the chamber within the casing 8 and above the oil level 20. However, as such occurrences are rare and not prolonged, it will be found that such brief communication with the outside air will not be too deleterious.

After the air has been expelled through this vent hole by excessive expansion in the transformer, and after the transformer and its oil has cooled down, the bell 10 will drop to its lowest position. By virtue of the air expelled through the vent hole 9, it will have created a partial vacuum under the bell 10. The oil column in the vent tube 16 or U-shaped tube 16 will become unbalanced allowing air to bubble into the bell from the atmosphere thereby relieving the negative pressure under the bell. During the upward movement of the bell, of course, the U-shaped tube 16 having an air inlet 24 and air outlet 18, acts as an air seal because of the oil contained within it and also due to the U-shape of tube 16.

It should be clear that during normal movement of the bell and normal operation of the transformer, the air above the transformer moves back and forth between the space underneath the bell shaped member 10 and the air compartment above in the top of tank 2.

In other words, the bell 10 having been raised to the top of its travel, any additional air being expelled from the top of the chamber 2 will exert a pressure under bell 10 which will expel air through the vent 9. Now when the coil windings of the transformer and the oil in the container 2 cool down, the air which has been expelled from pipe 6 will be drawn into container 2 through the pipe 6, thus permitting bell 10 to settle down. Since air has settled from under bell 10 through vent 9, when the bell settles down there will be an insufficiency of air under bell 10 to completely fill the original space in the container 2 so that as the oil in container 2 cools there will be a partial vacuum formed under bell 10. The atmospheric pressure in container 8 will balance out the vacuum tendency in bell 10 through the curved or U-shaped vent tube 16 so that the pressure becomes equalized both inside and outside of bell 10.

In order to balance the bell, weights such as washers 26 placed over studs 28 may be used. To prevent binding of the bell shaped member 10 during its movement, guide wheels 1, 3, 4, 5, are provided fastened to the bell 10. In the event that the bell 10 tips, the guide wheels, of course, come into play and serve to prevent any binding tendencies due to the tipping.

Having thus described my invention, what I claim is:

1. In apparatus of the character described, a covered casing, liquid within the casing, a bell member within the casing, a U-shaped tubular seal and a vent in said member, and, means for forcing fluid to the under surface of said bell shaped member whereby said member moves up and down in said liquid, and whereby upon excessive movement of said member out of said fluid, the under surface of said member is placed in intermittent air communication with the atmosphere through the action of said vent.

2. In apparatus of the character described, a covered casing, a liquid within the casing, a bell shaped member within the casing, means to partially float said member within said casing, means for causing said bell shaped member to be moved vertically within said casing, means for balancing said member within said casing during its movement, means for guiding the movement of said member within said casing to prevent binding of said member during its movement, a U-shaped tubular seal and a vent in said member, said vent establishing intermittent air communication to the space above the surface of said liquid with the under side of said bell when said bell member is moved excessively out of said liquid.

3. An expansion chamber for a tank, containing electrical apparatus, a communicating member connecting said expansion chamber and said tank, a casing for said expansion chamber, a liquid within said casing, a bell-shaped member within said casing, means for vertically floating said bell, guide rollers on said bell-shaped member to prevent binding of said member within the casing, a U-shaped tubular seal and a vent in said member to establish intermittent air communication to a space above the surface of said liquid with the underside of said bell when said bell is moved excessively out of said liquid.

4. An expansion chamber for a tank, containing electrical apparatus, a communicating member connecting said expansion chamber and said tank, a casing for said expansion chamber, a liquid within said casing, a bell-shaped member within said casing, means for vertically floating said bell, adjustable means for controlling the buoyancy of said bell, guide rollers on said bell-shaped member to prevent binding of said member within the casing, a U-shaped tubular seal and a vent in said member to establish intermittent air communication to a space above the surface of said liquid with the underside of said bell when said bell is moved excessively out of said liquid.

5. An expansion chamber for a tank containing electrical apparatus immersed in a liquid, a cylindrical casing for said expansion chamber, a cover for said casing, a liquid within said casing, a bell-shaped member within said casing, a pontoon secured to said bell for floating the bell within said liquid, a tube for establishing liquid communication between said expansion chamber and the tank containing electrical apparatus, a liquid seal and a vent in said bell-shaped member to provide intermittent air communication to a space above the surface of said liquid and the under side of said bell when said bell is moved excessively out of said liquid.

6. An expansion chamber for a tank containing electrical apparatus immersed in a liquid, a cylindrical casing for said expansion chamber, a top cover for said casing, a liquid within said casing, a bell-shaped member within said casing, a ring-like pontoon secured to the lower portion of said bell for floating the bell within said liquid, a tube for establishing liquid communication between said expansion chamber and the tank containing electrical apparatus, a U-shaped liquid seal and a vent in said bell-shaped member to provide intermittent air communication to a

space above the surface of said liquid and the underside of said bell when said bell is moved excessively out of said liquid.

7. An expansion chamber for a tank containing electrical apparatus immersed in oil, a cylindrical casing for said expansion chamber, a cover for said casing, said casing normally half filled with oil within said casing, a bell-shaped member within said casing, a pontoon secured to said bell for floating the bell within said oil, a tube for establishing oil communication between said expansion chamber and the tank containing electrical apparatus, said tube extending just beyond the normally half filled oil level within said casing, an oil seal and a vent in said bell-shaped member to provide intermittent air communication to a space above the surface of said oil and the under side of said bell when said bell is moved excessively out of said oil.

LLOYD L. YOUNG.