

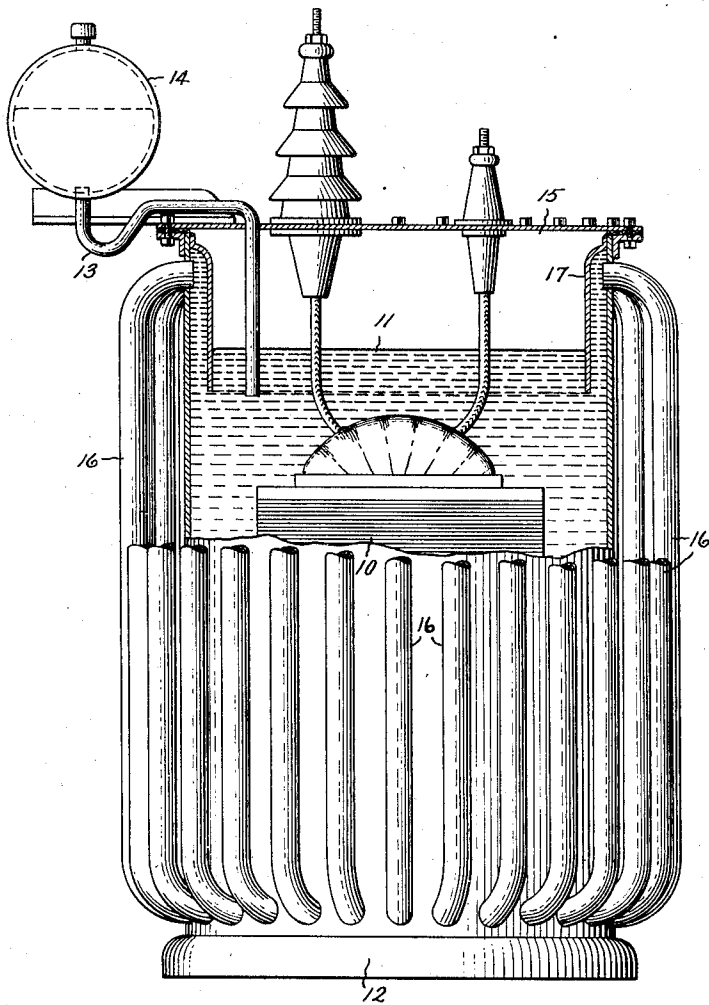
Nov. 24, 1931.

W. S. MOODY

1,833,719

TRANSFORMER

Filed June 24, 1931



Inventor:
Walter S. Moody,
by *Charles E. Tullow*
His Attorney.

UNITED STATES PATENT OFFICE

WALTER S. MOODY, OF PITTSFIELD, MASSACHUSETTS, ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK

TRANSFORMER

Application filed June 24, 1931. Serial No. 546,654.

My invention relates to electrical induction apparatus such as transformers and reactors of the type in which the apparatus is immersed in an insulating and cooling liquid in a casing which is provided with external radiators. In some cases, it is considered desirable to provide a gas cushion above the liquid in the casing to reduce the initial shock in case of a sudden increase of pressure or explosion in the casing. An external radiator must be connected near the top and bottom of the casing so that the liquid heated by the apparatus in the casing may flow into the radiator to be cooled and thence back into the casing ready to absorb more heat. To be most effective the radiators should have a large radiating surface and so should be as long as possible. Thus, the upper ends of the radiators should be connected as near as possible to the top of the casing. If the upper ends of the radiators are connected to the casing above the surface of the liquid, however, and communicate with the gas filled space, then the liquid cannot flow into the radiators to be cooled. The general object of the invention is to provide an improved arrangement which will permit the use of a gas cushion with the radiators connected close to the top of the casing and above the surface of the liquid and which will at the same time provide an efficient circulation of the liquid through the radiators.

The invention will be explained more fully in connection with the accompanying drawing which shows an encased, liquid-immersed transformer constructed in accordance with the invention, the view shown being partly in section to reveal details.

The transformer 10 shown in the drawing is immersed in a body of insulating and cooling liquid 11 in a casing 12. The liquid 11 extends through a pipe connection 13 and partially fills a conservator 14 to permit expansion and contraction of the liquid under changing temperature conditions. A cushion of gas 15, preferably an inert gas such as nitrogen, is provided above the liquid 11 in the casing 12 to reduce the initial shock of an explosion or any sudden increase in pressure within the casing 12, the pipe connection 13

extending below the gas cushion and into the liquid so that the gas cannot escape into the conservator.

The casing 12 is provided with external heat radiators 16 which are shown as simple vertical tubes with their upper and lower ends curved and welded into openings near the top and bottom of the casing wall, the upper ends of the tubes above the surface of the main body of liquid 11 and the bottom of the gas cushion 15. Thus, the length of the tubes is not limited by the presence of the gas cushion.

A cylindrical wall or partition 17 is spaced inside the wall of the casing 12, the lower edge of the wall 17 extending below the surface of the liquid 11 and the upper edge of this wall 17 being flanged outwardly and sealed by welding or otherwise to the wall of the casing 12 close to its upper edge and above the openings into the tubes 16. The liquid 11 extends upwardly through the space between the wall 17 and the wall of the casing 12 to the openings into the tubes 16 and also fills the tubes. Heat produced in the transformer during its operation is absorbed by the main body of liquid 11 surrounding it which rises by convection through the space between the wall 17 and the wall of the casing 12 whence it enters the tubes 16 where it is cooled. After descending through the tubes 16, the cooled liquid returns into the bottom of the casing 12 to absorb more heat from the transformer. The wall 17 should be spaced far enough from the wall of the casing 12 so that the flow of liquid into the upper ends of the tubes 16 will not be restricted. Thus, the cross sectional area of this space between the two walls is preferably at least equal to the sum of the cross sectional areas of the openings in all the tubes 16. The invention makes it possible to provide a substantial gas cushion above the main body of liquid in which the transformer is immersed and without interfering in any way with the use of the most efficient full length heat radiators for cooling the liquid.

The invention has been explained by describing and illustrating a particular form and application thereof but it will be obvious

that changes may be made without departing from the spirit of the invention and the scope of the appended claims.

What I claim as new and desire to secure by
5 Letters Patent of the United States is:

1. The combination with electrical apparatus immersed in a liquid within a casing, of a gas cushion above the liquid in the casing, an external heat radiator communicating
10 with the upper and lower parts of said casing, the upper end of said radiator opening into the casing above the bottom of said gas cushion, and means providing a passageway sealed from said gas cushion and leading from the
15 liquid surrounding the apparatus to the opening into the upper end of said radiator.

2. The combination with electrical apparatus immersed in a liquid within a casing, of a gas cushion above the liquid in the casing, an
20 external heat radiator communicating with the upper and lower parts of said casing, the upper end of said radiator opening into the casing above the bottom of said gas cushion, and a wall spaced inside said casing and
25 sealing said gas cushion from the opening into the upper end of said radiator.

3. The combination with electrical apparatus immersed in a liquid within a casing, of a gas cushion above the liquid in the casing,
30 a plurality of external heat radiators communicating with the upper and lower parts of said casing, the upper ends of said radiators opening into the casing above the bottom of said gas cushion, and a cylindrical wall
35 spaced inside said casing, the upper edge of said inner wall being sealed to said casing above the openings into the upper ends of said radiators, and the lower edge of said inner wall extending below said gas cushion.

40 In witness whereof, I have hereunto set my hand.

WALTER S. MOODY.

45

50

55

60

65