Feb. 23, 1932. G. A. MATTHEWS 1,846,887

ELECTRICAL INDUCTION APPARATUS

Original Filed May 24, 1930

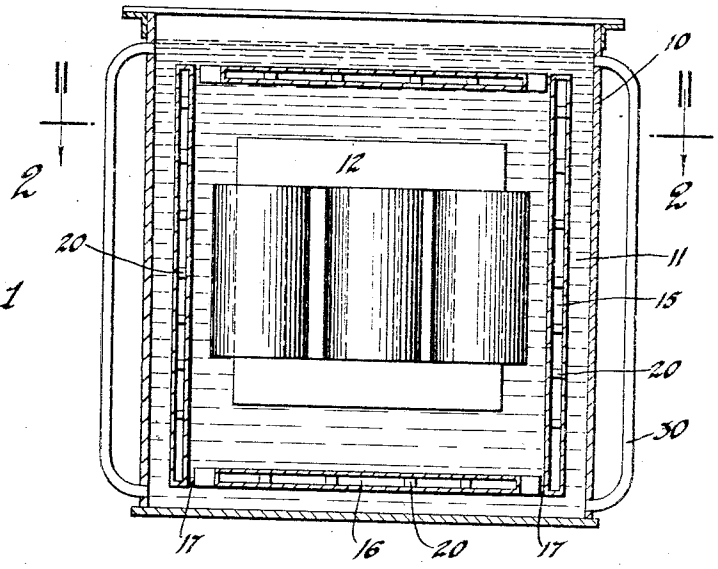

Fig. 1

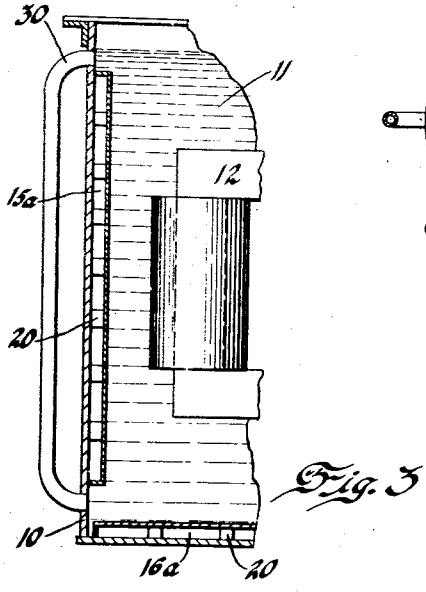

Fig. 3

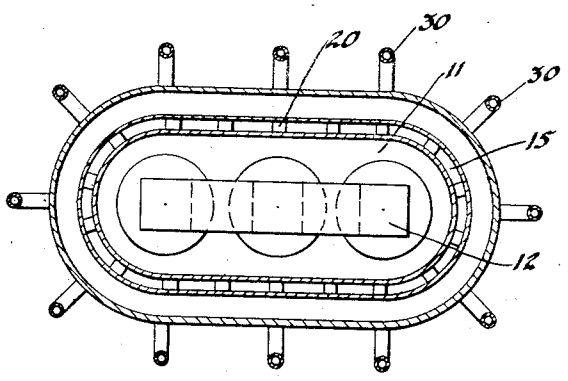

Fig. 2

INVENTOR.
George A. Matthews
BY Francis O. Hardesty
ATTORNEY

Patented Feb. 23, 1932 1,846,887

UNITED STATES PATENT OFFICE

GEORGE A. MATTHEWS, OF DETROIT, MICHIGAN, ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK

ELECTRICAL INDUCTION APPARATUS

Application filed May 24, 1930, Serial No. 455,214. Renewed December 11, 1931.

The present invention relates to the interference with transmission of sound producing vibrations and while described specifically with respect to liquid filled transformers, is applicable to any liquid filled electrical induction apparatus in which the sound vibration producing element is submerged or surrounded by liquid.

Liquid filled transformers, regulators, and the like, are usually constructed of a suitable unit, such as a magnetic core and a winding or windings, submerged in a body of liquid in a metallic container of comparatively thin walls.

As is well known, in any alternating current induction device, there is usually developed a sound known as "A. C. hum" when the device is operating, and in apparatus of the type indicated, especially in large units, this hum often is so loud as to be quite objectionable.

The noise produced by transformers and similar alternating current apparatus probably is caused by radition from vibrating surfaces and its intensity is a function of the frequency and amplitude of this vibration. It is a well known fact that solids and liquids transmit vibrations much better than air or gases and, in the case of transformers and similar alternating current apparatus, where the device is enclosed and filled with oil or other liquids, the vibrations from the core and windings or other corresponding unit are transmitted by the oil or other liquid to the case or container, causing the latter to vibrate and produce the noise so characteristic of this type of apparatus.

Among the objects of the present invention is to eliminate such noise or at least reduce it to such degree as to be unobjectionable.

Another object is the provision of a simple and effective means which will reduce or eliminate the hum but which may be added to a conventional transformer or similar device without in any way interfering with the operation thereof, but which actually may increase its efficiency by providing a more efficient cooling.

The following description and drawings illustrate the application of the invention to a conventional transformer, but it is to be understood that it is not to be confined to the use with transformers only, but may be used in any alternating current induction apparatus where similar conditions exist, such as in voltage regulators, contactors, etc., as above mentioned.

Other objects will readily occur to those skilled in the art by reference to the following description and the accompanying drawings in which

Fig. 1 is a more or less diagrammatic vertical central section through a conventional transformer showing an embodiment of the present invention.

Fig. 2 is a horizontal section on the line 2—2 of Fig. 1.

Fig. 3 is a partial vertical section showing a modified form of construction.

As indicated in the drawings, the transformer includes a container or tank 10, adapted to contain a body of liquid 11 such as a suitable oil, in which is submerged the magnetic core and windings indicated diagrammatically at 12.

There may also be provided the externally arranged circulating cooling pipes 30 of which a few are shown though it should be understood that as many may be used as will be found desirable.

In the conventional device, vibrations set up in the core 12 are transmitted to the liquid 11, which is always a good transmitter, and impressed upon the container 10, with the result that the more or less resilient whole produces quite a loud hum or audible vibration.

In the present invention, the transmitting of the vibration by the liquid is interfered with by surrounding the core unit with a vi-

bration absorbing element 15 indicated as supported in any suitable manner in the space between the core unit 12 and the walls of the container 10 and in the preferred form spaced from both, although as indicated in Fig. 3, it may be made as part of the container itself or even as a part of the core unit.

The preferred form of such elements as indicated, consists of a double walled element 15 completely surrounding the transformer 12 and open at both ends or having discs 16 of similar construction spaced therefrom in order to provide passages 17. The liquid inside the vibration absorbing element 15 is in communication with that outside this element through the openings 17 at its upper and lower ends so that the liquid may circulate readily and be cooled. The liquid heated by the transformer rises by convection within the element 15 and through the openings 17 and descends along the walls of the container 10 and also through the cooling pipes 30 where such pipes are used. The space between the walls of the elements 15 and 16 may be exhausted if means is provided to prevent collapse, or air or other sound deadening medium may be used. Any suitable means for supporting these elements in the tank or container may be used. Further, in order to insure the elements 15 and 16 against collapse due to pressure when the element is constructed with comparatively thin walls, spacing blocks of suitable non-resilient material, such as cork, hard felt, etc. may be used. Such spacers are indicated at 20.

As indicated in Fig. 3, instead of providing a separate shield, as in Figs. 1 and 2, the shield may be formed integrally with one or the other of the elements 10 and 12, that is, either the transformer or the container 10 or the core unit, or both. In this figure, the shield is shown as an integral part of the container which is shown as having a hollow double wall at 15*a* and a hollow double walled bottom at 16*a*, the spaced walls being supported by spacers 20 as in Figs. 1 and 2.

In apparatus provided with the above described shield, vibration forces set up by the core unit in the liquid within the shield will not be fixedly transmitted through the latter to the liquid between the shield and the container but absorbed by the shield.

The position and shape of the shield may of course, be changed to conform to the particular design of the apparatus, and such changes are contemplated as being desirable, particularly when the vibration emitting surfaces, terminal connections, etc. are arranged in a different or an unconventional manner.

Now having described the invention and the preferred embodiment thereof, it is to be understood that the said invention is to be limited, not to the specific details herein set forth and illustrated, but only by the scope of the claims which follow.

I claim:—

1. Electrical induction apparatus including a magnetic core, a liquid filled container within which the said core is supported, and a vibration absorbing shield completely surrounding the core between the core and the outer wall of the container.

2. Electrical induction apparatus including a liquid holding container, a magnetic core submerged in the liquid within the container, and a vibration absorbing shield within the container and surrounding said core, the liquid within the shield being in communication with that outside the shield to permit circulation of the liquid.

3. Electrical induction apparatus including a liquid holding container, a magnetic core submerged in said liquid within the container, and a vibration absorbing shield submerged in said liquid within the container and surrounding said core, the liquid within the shield being in communication with that outside the shield to permit circulation of the liquid.

4. Electrical induction apparatus including a liquid holding container, a magnetic core submerged in the liquid within the container, and means for reducing emission of noise, said means including a hollow walled element surrounding and spaced from said core and from the container, and said element having openings to permit circulation of said liquid.

5. Electrical induction apparatus including a liquid holding container, a magnetic core submerged in said liquid, means for reducing emission of noise, said means including a hollow walled metallic shield submerged in said liquid and surrounding said core, the upper and lower ends of said shield being open to permit circulation of said liquid, and hollow walled disks partially closing the upper and lower openings in said shield, said shield and disks being spaced from said core and from the walls of said container.

6. Electrical induction apparatus including a liquid holding container, a magnetic core submerged in said liquid, means for reducing emission of noise, said means including a hollow walled metallic shield submerged in said liquid and surrounding said core, said shield containing a sound absorbing medium, the upper and lower ends of said shield being open to permit circulation of said liquid, and hollow walled disks partially closing the upper and lower openings in said shield, said disks containing a sound absorbing medium, and said shield and disks being spaced from said core and from the walls of said container.

7. Electrical induction apparatus including a liquid holding container, a magnetic

core supported in said liquid, and a vibration absorbing shield between said core and the outer wall of said container, said shield completely surrounding the core and having openings to permit circulation of said liquid through the shield.

8. Electrical induction apparatus including a liquid holding container, a magnetic core supported in said liquid, and a hollow walled vibration absorbing shield containing a sound absorbing medium between said core and the wall of said container, the liquid within the shield being in communication with that outside the shield to permit circulation of the liquid.

GEO. A. MATTHEWS.