J. J. MULLEN.

SELF COOLED TRANSFORMER.

APPLICATION FILED AUG. 21, 1911.

1,039,577.

Patented Sept. 24, 1912.

Fig. 1.

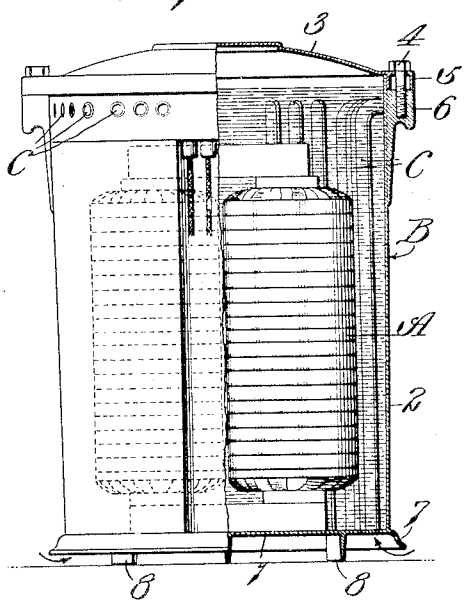


Fig. 2.

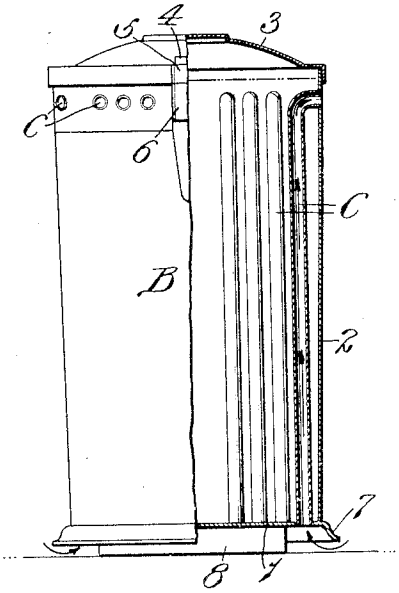


Fig. 4.

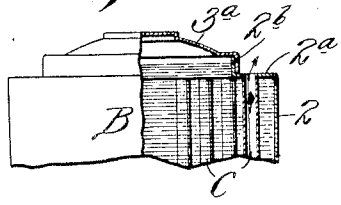


Fig. 3.

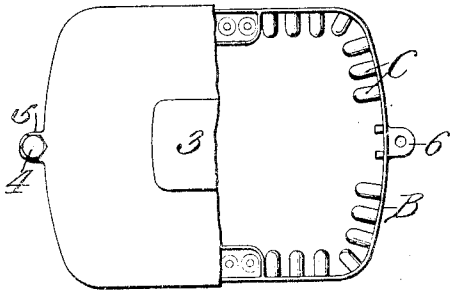
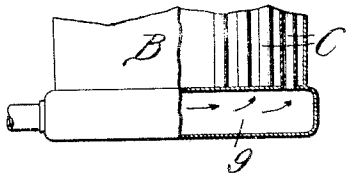


Fig. 5.



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UNITED STATES PATENT OFFICE.

JAMES J. MULLEN, OF ST. LOUIS, MISSOURI, ASSIGNOR TO MOLONEY ELECTRIC COMPANY, OF ST. LOUIS, MISSOURI, A CORPORATION OF MISSOURI.

SELF-COOLED TRANSFORMER.

1,039,577. Specification of Letters Patent. Patented Sept. 24, 1912.

Application filed August 21, 1911. Serial No. 645,051.

To all whom it may concern:

Be it known that I, JAMES J. MULLEN, a citizen of the United States, residing at St. Louis, Missouri, have invented a certain new and useful Improvement in Self-Cooled Transformers, of which the following is a full, clear, and exact description, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to self-cooled transformers, and particularly to the tanks or casings of such transformers which contain the liquid in which the transformer is submerged.

The main object of my invention is to provide a self-cooled transformer which is so designed that the temperature rise is lower and more uniform than in the various types of self-cooled transformers heretofore used.

Another object is to provide an inexpensive and compact casing or tank for self-cooled transformers which has a greater percentage of heat-radiating surface than the tanks heretofore used for incasing self-cooled transformers.

Other objects and desirable features of my invention will be hereinafter pointed out.

Figure 1 of the drawings is a side elevational view, partly broken away, of a self-cooled transformer constructed in accordance with my invention; Fig. 2 is a similar view of the casing taken at approximately right angles to Fig. 1; Fig. 3 is a top plan view of the casing with the removable top broken away so as to more clearly illustrate the arrangement of the air conduits; Fig. 4 is a detail view illustrating a slight modification of my invention; and Fig. 5 is a detail view illustrating still another slight modification of my invention.

Referring to Figs. 1 to 3, inclusive, which illustrate the preferred form of my invention, A designates a transformer of any preferred type or design that is arranged inside of a casing or tank B which contains a liquid, preferably oil, in which the transformer is submerged. The casing A may be formed either from sheet metal or cast metal but I prefer to form it from cast metal and cast the bottom 1 integral with the side walls 2. The top 3 of the casing is preferably removable and is retained in position by suitable fastening devices such, for example, as screws 4 which pass through ears 5 on the top 3 and project into screw-threaded openings in coöperating ears 6 on the sides of the casing.

Air conduits C are arranged inside of the casing so as to absorb heat from the liquid and thus give a relatively great heat-radiating surface in addition to the side walls of the casing. Said conduits are so arranged that they are surrounded on all sides by the liquid in the casing and they are so constructed that currents of air will circulate through same continuously. In the embodiment of my invention shown in Figs. 1 to 3, the conduits C are open at both ends and are arranged vertically inside of the casing B a slight distance from the inner surface of the casing, the ends of said conduits projecting through openings in the casing or terminating inside of the casing and communicating with openings therein. I prefer to form the conduits C from pieces of pipe which are arranged in the mold in which the casing is formed prior to the operation of pouring the molten metal into the mold, thereby producing a structure in which the conduits are practically cast integral with the casing. The lower ends of the conduits project through the bottom 1 of the casing, and the upper ends of said conduits branch outwardly, as shown in Figs. 1 to 3, and project through the side walls of the casing adjacent the upper edges of same. It is immaterial, however, so far as my invention is concerned, whether the conduits are connected to the casing in the manner above-described or in other ways as my broad idea consists in providing the casing of a self-cooled transformer with open-ended air conduits that are submerged in or surrounded by the liquid in the casing that receives the heat from the transformer.

Instead of having the upper ends of the conduits C branch laterally and project through the side walls of the casing, as previously described, said conduits may be straight and project through the top 2^a of the casing, as shown in Fig. 4, said top 2^a being cast integral with the side walls 2 of the casing, and the removable portion of the casing consisting of a cover 3^a that fits snugly over a flange 2^b on said top.

In order that air will circulate upwardly through the conduits C I provide the casing with means that holds the bottom 1 of the casing a sufficient distance away from

the support on which the casing rests to permit air to travel under the flange 7 on the lower end of the casing and pass upwardly through the conduits C, as indicated by the arrows in Fig. 1. One means that may be used for this purpose consists of depending flanges 8 on the bottom of the casing which act as supporting legs for the casing and also as skid-rails that permit the casing to be dragged or pushed easily over the support on which it rests.

The heat which radiates from the conduits C and passes upwardly through same is sufficient to induce currents of air upwardly through said conduits, but, if desired, the casing can be provided at its lower end with an air chamber 9, as shown in Fig. 5, that communicates with the lower ends of the conduits C and to which air is supplied by any suitable means, not shown, so as to force currents of air upwardly through the conduits C. Instead of forcing air up through the conduits C a suction-producing device, not shown, could be connected to the air chamber 9 so as to cause air to travel downwardly through the conduits C.

The temperature rise of a self-cooled transformer of the construction above-described is lower and more uniform than in the self-cooled transformers heretofore in use because the casing of the transformer is provided with a heat-radiating surface of relatively great area consisting of the side walls of the casing and conduits C that are completely surrounded by the oil in the casing and which are so arranged that currents of air will travel through same continuously and thus carry away the heat which radiates from said conduits. Furthermore, a transformer casing of the construction above-described is inexpensive to manufacture, it is symmetrical and presents a neat and ornamental appearance, and it is compact.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:

1. A self-cooled transformer consisting of a casing that is adapted to contain a liquid, a transformer arranged inside of said casing, and vertically disposed air conduits arranged inside of said casing adjacent the side walls of same and having their upper and lower ends communicating with the atmosphere so that currents of air will travel through said conduits.

2. A self-cooled transformer consisting of a casing that is adapted to contain a liquid, a transformer arranged inside of said casing, vertically disposed air conduits arranged inside of said casing adjacent the side walls of same and having their upper and lower ends communicating with the atmosphere so that currents of air will travel through said conduits, and means for holding the bottom of the casing far enough away from the support on which the casing rests to permit air to enter the lower ends of said conduits.

3. A casing or tank for self-cooled transformers consisting of a cast metal shell whose bottom and side walls are integrally connected together, vertically disposed air conduits arranged inside of said shell and integrally connected to the bottom of the shell, the upper ends of said conduits communicating with the atmosphere so as to permit currents of air to circulate through said conduits, and a removable top or cover for said shell.

4. A casing or tank for self-cooled transformers consisting of a cast metal shell whose bottom and side walls are integrally connected together, vertically disposed air conduits arranged inside of said shell and integrally connected to the bottom of the shell, the upper ends of said conduits communicating with the atmosphere so as to permit currents of air to circulate through said conduits, a removable top or cover for said shell, and depending flanges on the bottom of the shell which hold same a sufficient distance from the support on which the casing rests to permit air to enter the lower ends of said conduits.

In testimony whereof I hereunto affix my signature in the presence of two witnesses, this 16th day of August 1911.

JAMES J. MULLEN.

Witnesses:
WELLS L. CHURCH,
GEO. R. LADSON.