Nov. 2, 1926. 1,605,026

L. H. HILL ET AL

TRANSFORMER

Filed Sept. 10, 1924 2 Sheets-Sheet 1

Fig. 1.

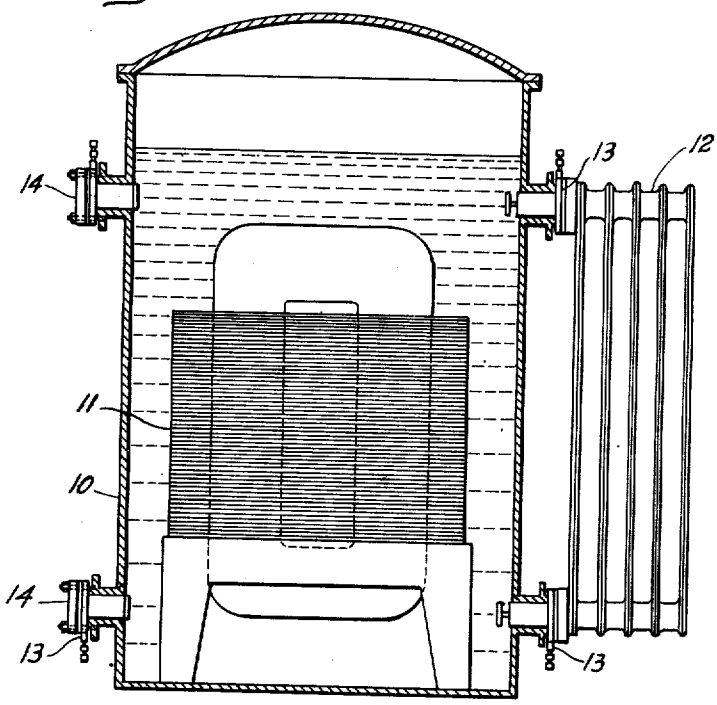
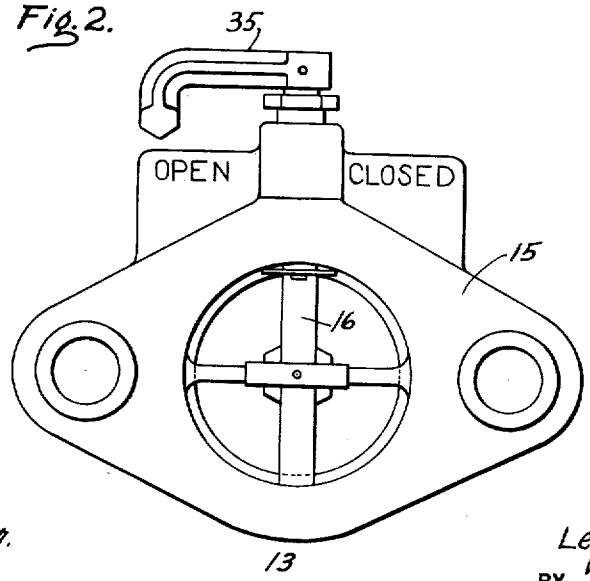


Fig. 2.



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Fig. 3.

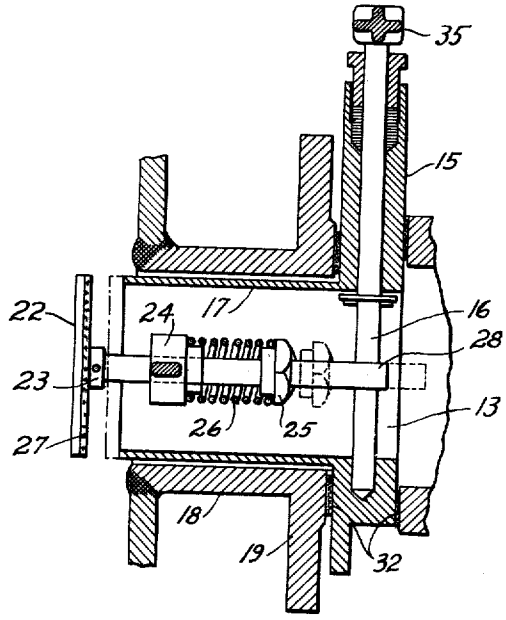


Fig. 4.

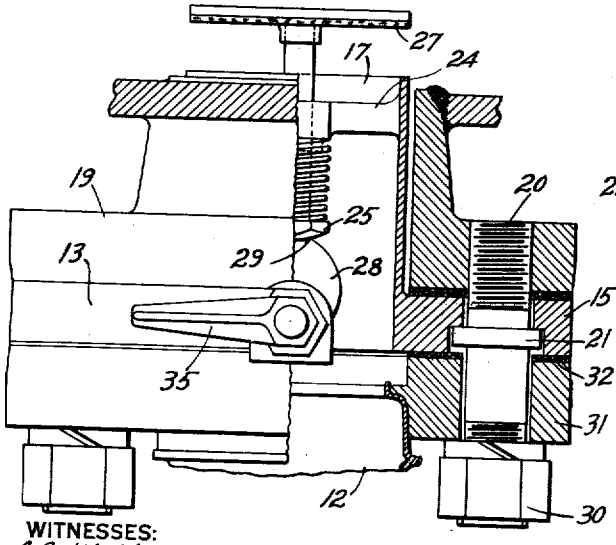
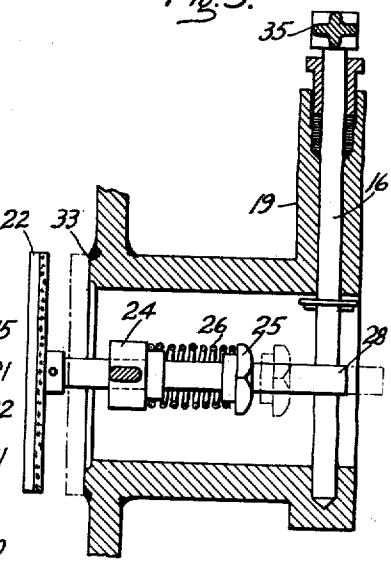


Fig. 5.



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UNITED STATES PATENT OFFICE.

LELAND H. HILL, OF SWISSVALE, AND WALTER M. DANN, OF WILKINSBURG, PENNSYLVANIA, ASSIGNORS TO WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY, A CORPORATION OF PENNSYLVANIA.

TRANSFORMER.

Application filed September 10, 1924. Serial No. 736,828.

Our invention relates to incased electrical apparatus, such as oil-immersed transformers, and particularly to apparatus of this character, that is provided with external radiators for aiding in the dissipation of the heat generated in the transformer.

It is desirable to have the external radiators of large transformers or similar apparatus detachable in order that they may be removed during transit on account of the size of the transformer tank. The transformer windings are carefully dried and the tank filled with hydrated oil when the transformer is tested in the factory prior to shipment. In order to avoid a repetition of these operations when the transformer is placed in service, it is desirable to ship the tank filled with oil. Prior to our invention it was necessary to remove the oil after the transformer was tested, remove the radiators and provide special closures for the radiator openings, refill the tank with oil and then remove the oil again at the place of installation in order to attach the radiators.

It has been proposed to use valves between the tank and the radiator but this arrangement has not been considered practicable because the ordinary valves obstructed the flow of oil and the length of the valve greatly increased the spacing between the radiator and the tank. The disadvantages of this construction were the decreased rating efficiency and the increased size of the transformer, and these defects were so serious as to preclude the use of any type of valve heretofore. The increased size of the transformer limited the maximum capacity of apparatus that could be shipped assembled. Furthermore the increased spacing of the radiators weakened the construction, as the radiators are ordinarily supported on the tank.

In accordance with our invention, a telescoping valve is provided which does not obstruct the flow of oil through the radiator and does not appreciably increase the spacing between the radiator and the tank. In this manner, the disadvantages attendant upon the use of an ordinary valve are overcome. In a transformer equipped with these valves between the tank and the radiator, the removal and replacement of a defective radiator may be accomplished without disconnecting the transformer from service, if one of the radiators becomes damaged.

For a more complete understanding of the nature of our invention, reference should be had to the accompanying drawings in which,

Figure 1 is a view in vertical section of an incased transformer embodying our invention;

Fig. 2 is an end view of the valve shown in connection with the transformer of Fig. 1;

Fig. 3 is a vertical sectional view through the valve shown in Fig. 2;

Fig. 4 is a plan view, partially in section and partially in elevation, of the valve shown in Figs. 2 and 3; and

Fig. 5 is a vertical sectional view of a modification.

Referring to Fig. 1, 10 denotes a casing enclosing an oil-immersed transformer 11 and provided with detachable radiators 12, only one being shown. Valves 13 of a special construction are interposed between the casing of the transformer 10 and the radiator 12.

It will be understood that the purpose of the radiator 12 is to increase the heat-dissipating and radiating capacity of the tank and thereby increase the load rating of the transformer. The telescoping valves 13 have a valve disc and seat projecting into the transformer tank and offer substantially no obstruction to the flow of oil through the radiators. If it is necessary to detach the radiators 12 during transit or in case the radiator is damaged, the valves are covered with a cover plate 14 to prevent loss of oil in case the valve is tampered with.

As shown in Figs. 2, 3 and 4, the valve 13 comprises a flange or base member 15 in which the operating rod 16 of the valve is supported. An integral tubular portion 17 of the valve projects through the connecting portion 18 of the transformer tank into the tank itself. The valve 13 is secured to the transformer flange 19 by threaded studs 20 having a shoulder 21 engaging the base 15 of the valve. The opening in the tubular portion 17 of the valve is closed by means of a valve disc 22 supported upon a horizontal valve stem 23. The valve stem 23 is mounted in a fin or crossbar 24 (see Fig. 4)

and is provided with a collar 25 co-operating with a compression spring 26 encircling the valve stem.

The spring 26, being normally under compression, tends to close the valve disc 22 upon the valve seat formed by the end of the tubular member 17. A layer of cork or other suitable packing material 27 is carried by the valve disc 22 to cooperate with the valve seat in order to make the valve oil tight. An eccentric cam 28 is mounted on the valve rod 16 and is adapted to reciprocate the valve stem and disc as the valve rod 16 is turned, thereby opening and closing the valve. The valve rod 16 is provided with an operating member or handle 35 for manipulating the same. The cam 28 is provided with a notch 29 co-operating with the rounded head of the collar 25 to latch the valve rod and disc in the open position.

As shown in Fig. 4, the radiator 12 is secured to the tank by a nut 30 upon the stud 20, the radiator having a flange 31 co-operating with said stud. This construction permits removal of the radiator while maintaining the valve in position on the flange of the tank since the shoulder 21 of the stud 20 holds the valve in place. Since the same stud secures both the valve and the radiator to the tank, the construction is simple and compact. The connections between the flange of the tank, the valve and the radiator are made oiltight by the use of gaskets 32.

The area of the opening through the valve 13 is substantially the same as the area of the opening in the radiator flange 18 and tests have indicated that the heat radiating capacity of the apparatus is not reduced when the valve is used. Therefore, the flow of oil to the radiators is not obstructed to an appreciable extent. Furthermore, the spacing of the radiator from the tank is only increased by an amount equal to the thickness of the flange or base 15, which is only a small part of the normal spacing between these elements. Therefore, the use of the valve does not weaken the construction as would be the case if the heavy radiator were spaced at a relatively large distance from the tank. Such a construction would require extra heavy flanges on the transformer tank or additional braces and these are avoided by the use of our invention.

In Fig. 5 is shown a modification of our invention in which the flange 19 of the transformer tank is drilled to receive the valve rod 16 and the inner surface of the flange is finished at the point 33 to provide a seat for the valve disc 22. The assembly of the valve shown in Fig. 5 is exactly the same as that shown in the preceding figures except for the changes noted. The radiator is secured directly to the flange 19 in the usual manner. By means of this construction, the structure of the valve is further simplified.

While we have described the best means known to us for carrying out the invention, it should be understood that such description is to be interpreted in an illustrative rather than in a limiting sense and that we do not wish to be restricted thereby to the exact details shown except as may be defined in the appended claims.

We claim as our invention:

1. The combination of a transformer tank, a radiator, said tank having a tubular projecting portion to which said radiator is secured, and a valve telescoping with the transformer, the valve comprising operating elements disposed in said projecting portion and a disc connected thereto and disposed inside of said tank.

2. The combination of a transformer tank, a radiator, a horizontal connection between said tank and said radiator, a valve disc provided with a horizontal stem for closing said connection, and means including a cam cooperating with said stem for operating said valve disc.

3. The combination with a transformer tank, a radiator and a valve between said tank and radiator, of securing studs in said tank having a shoulder engaging said valve and means on said stud for securing the radiator to the tank.

4. The combination of a transformer tank, a radiator, said tank having a tubular projecting portion to which said radiator is secured, a valve structure comprising a tubular portion insertable into the tubular portion of the tank, a disc for closing the inner end of the tubular portion of the valve, operating means for the disc, and a flange co-operating with the outer ends of the tubular portions of the tank and valve for forming a fluid-tight joint.

5. The combination of a transformer tank, a radiator, said tank having a tubular projecting portion to which said radiator is secured, a valve structure comprising a tubular portion insertable into the tubular portion of the tank, a disc biased to its closed position for closing the inner end of the tubular portion of the valve, operating means for the disc, and a flange co-operating with the outer ends of the tubular portions of the tank and valve for forming a fluid-tight joint.

6. The combination of a transformer tank, a radiator, said tank having a tubular projecting portion to which said radiator is secured, a valve structure comprising a tubular portion insertable into the tubular portion of the tank, a flange at its outer end, a disc biased to its closed position for closing the inner end of the tubular portion of the valve, and operating means for the disc, said flange co-operating with the

tubular portion of the tank and the radiator for forming a fluid-tight joint.

7. The combination of a transformer tank, a radiator, said tank having a tubular projecting portion to which said radiator is secured, a valve structure comprising a tubular portion insertable into the tubular portion of the tank, a flange at its outer end, a disc biased to its closed position for closing the inner end of the tubular portion of the valve, and operating means for the disc, said flange fitting between the tubular portion of the tank and the radiator for forming a fluid-tight joint.

In testimony whereof, we have hereunto subscribed our names this 4th day of September, 1924.

LELAND H. HILL.
WALTER M. DANN.

tubular portion of the tank and the radiator for forming a fluid-tight joint.

7. The combination of a transformer tank, a radiator, said tank having a tubular projecting portion to which said radiator is secured, a valve structure comprising a tubular portion insertable into the tubular portion of the tank, a flange at its outer end, a disc biased to its closed position for closing the inner end of the tubular portion of the valve, and operating means for the disc, said flange fitting between the tubular portion of the tank and the radiator for forming a fluid-tight joint.

In testimony whereof, we have hereunto subscribed our names this 4th day of September, 1924.

LELAND H. HILL.
WALTER M. DANN.

Certificate of Correction.

It is hereby certified that in Letters Patent No. 1,605,026, granted November 2. 1926, upon the application of Leland H. Hill, of Swissvale, and Walter M. Dann, of Wilkinsburg, Pennsylvania, for an improvement in "Transformers," errors appear in the printed specification requiring correction as follows: Page 1, line 13, for the word "hydrated" read *dehydrated*, and line 32, for the word "rating," read *radiating;* page 2, line 81, claim 1, after the word "transformer" insert the word *tank;* and that the said Letters Patent should be read with these corrections therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 7th day of December, A. D. 1926.

[SEAL.]

M. J. MOORE,
Acting Commissioner of Patents.

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M. J. MOORE,
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