

Dec. 4, 1923.

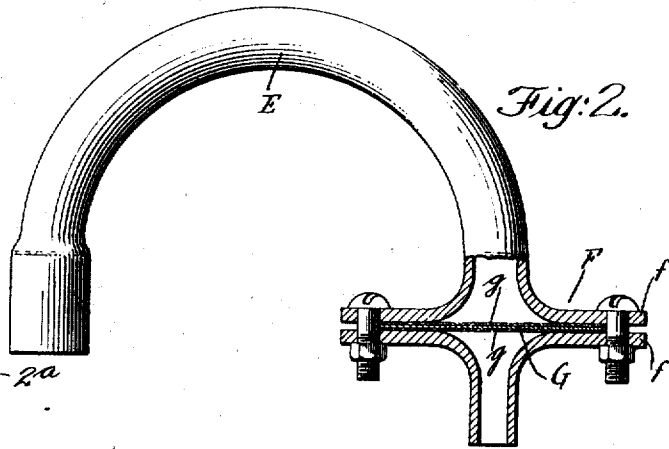
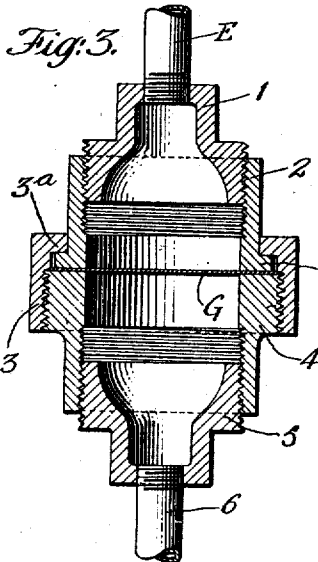
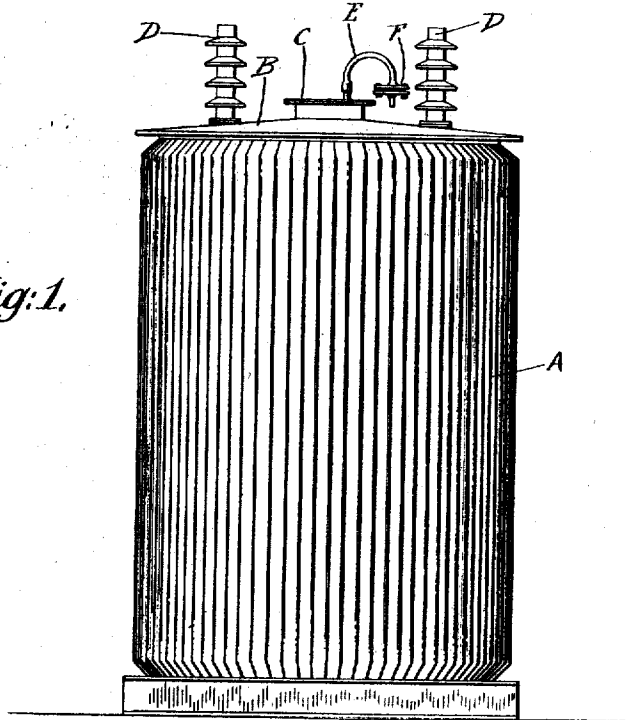
1,476,138

R. V. BINGAY

TRANSFORMER

Filed Sept. 6, 1921

Fig. 1.



Robert V. Bingay INVENTOR
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UNITED STATES PATENT OFFICE.

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TRANSFORMER.

Application filed September 6, 1921. Serial No. 498,769.

To all whom it may concern:

Be it known that I, ROBERT V. BINGAY, a citizen of the United States, residing at Pittsburgh, in the county of Allegheny and State of Pennsylvania, have invented certain new and useful Improvements in Transformers, of which the following is a specification.

In electric transformers containing oil for insulating and cooling purposes, it is customary not to completely fill the transformer tank with the oil unless an expansion or overflow tank is provided, in which case the overflow tank is not completely filled. Thus, in either case there is present an air space above the oil. When the transformer becomes heated the oil expands and it is customary to provide an outlet in the upper part of the tank for the air to pass from the tank to the external atmosphere during the heating and expansion of the oil. When the transformer cools, the reverse operation takes place and outside air is drawn into the tank. This action results in a certain amount of moisture being carried into the air space of the tank and consequently to the oil with each cooling of the transformer. Even if care has been taken to exclude all moisture from the oil and air space when the transformer is assembled, it results that after continued use considerable moisture will be introduced by the action above described, unless special means is taken to prevent it. As moisture in oil causes its insulating properties to deteriorate in accordance with the amount of moisture absorbed, it becomes important to prevent any accumulation of moisture or to reduce its presence to a minimum if the high insulating quality of the oil is to be maintained.

Many devices have been resorted to for overcoming the above difficulty but have not proved satisfactory, either on account of the cumbersomeness of the auxiliary devices provided which are expensive and occupy valuable space, or require regular attention on the part of the operator.

The object of my invention is to provide a device which will be effective in operation, simple and durable in construction and occupy a small amount of space, and at the same time require a minimum degree of attention on the part of the operator, and which will operate to prevent moisture from entering the tank.

My invention and its advantages will be understood from the following description and accompanying drawings.

Fig. 1 is a side elevation of a transformer embodying my invention, Fig. 2 is a vertical central section of a portion of the auxiliary attachment, and Fig. 3 is a modification of the device.

Fig. 1 shows one form of transformer to which my improvement is applied, but my invention may be applied to any form of transformer construction which is provided with a tank for enclosing the transformer and containing an insulating fluid with an air space above it. In Fig. 1 a fluted tank A is illustrated which contains a transformer and has an air tight cover B. A manhole cover is indicated at C and the usual insulators D are shown for insulating the leads which pass out through the cover.

At the top of the tank and preferably in the cover is a pipe connection E with an air space. This pipe leads to a device F which contains a disc G of filter paper which permits the passage of air, and prevents the passage of moisture, such as the filter paper ordinarily used for filtering moisture out of oil. The device F may be of any suitable form for carrying the disc G. In the form shown in Figs. 1 and 2 the coupling comprises two oppositely disposed flanges, *f, f*, between which is clamped filter paper G. In the modification shown in Fig. 3, a standard coupling is shown having a part 1 which receives the pipe E. The part 1 is enlarged at its lower portion and has a threaded engagement with a part 2 having an outwardly extending flange 2^a. A nut 3 has an inwardly extending flange 3^a at its upper end which engages the flange 2^a. A part 4 has a threaded engagement with the nut 3 and in turn is engaged at its lower end by a reducing cap or nut 5 and carries the pipe 6 at its lower end. The disc G may obviously be easily inserted and removed.

In operation, when the transformer becomes heated and the oil level rises, air will be forced out through the pipe E and disc G. When the transformer cools and the oil level decreases, air will be drawn in through the disc G and pipe E; but in passing out through the filter disc G, the moisture will be prevented from passing through the disc G and dry air only will enter the transformer. When, upon subsequent expansion

of the oil the dry air is afterwards expelled from the transformer through the disc G it will absorb any moisture on the under surface or any moisture which may be absorbed in the disc G and will thus thoroughly dry the disc so that it will be in its most effective condition to prevent any moisture from entering the transformer when it cools.

Thus my invention effectively protects the transformer from the entrance of moisture and the filtering disc G is self drying and in effective condition for excluding moisture from entering the transformer each time air is drawn in and through the disc.

In some instances several discs G may be used, one over the other and spaced apart from each other, the number of the discs used and their spacing depending upon the capacity of the transformer and degree of expansion and contraction. The disc or discs may be reinforced or supported by wire gauze *g*, as shown in Fig. 2, if so desired.

The filter paper disks being fragile will puncture in the event of a sudden increase in pressure in the transformer tank, such as might occur from arcing at the transformer, and in this manner provide a free vent for the relief of excessive pressure within the tank.

I claim:—

1. The combination with a transformer tank or the like, containing a fluid and having an enclosed space permitting the fluid to expand and contract, of means for permitting the passage of air to and from said space comprising a material in the path of the inflowing air adapted to mechanically separate moisture therefrom so as to prevent said moisture from entering said tank, said material being adapted to yield up moisture to dry air so as to be dried thereby.

2. The combination with a transformer tank or the like, containing a fluid and having an enclosed space permitting the fluid to expand and contract, of means for permitting the passage of air to and from said space comprising a material in the path of the inflowing air adapted to mechanically separate moisture therefrom so as to prevent said moisture from entering said tank, said material being adapted to yield up moisture to dry air so as to be dried thereby, and assume a moisture excluding condition on exposure to dry atmosphere.

3. The combination with a transformer tank or the like, containing a fluid and having an enclosed space permitting the fluid to expand and contract, of means for permitting the passage of air to and from said space comprising a material in the path of the inflowing air adapted to mechanically separate moisture therefrom so as to prevent said moisture from entering said tank, said material being in the form of a disk through which the entering air passes.

4. The combination of a transformer tank or the like, containing a fluid and having an enclosed space permitting the fluid to expand and contract, of means for permitting the passage of air to and from said space comprising a filter paper in the path of the inflowing air adapted to mechanically filter out moisture therefrom so as to prevent said moisture from entering said tank.

5. The combination with a transformer tank or the like, containing a fluid and having an enclosed space permitting the fluid to expand and contract, of means for permitting the passage of air to and from said space comprising a material in the path of the inflowing air adapted to mechanically separate moisture therefrom so as to prevent said moisture from entering said tank, the said material being exposed on one side to the surrounding atmosphere.

6. The combination with an oil container forming an enclosed space adapted to contain air, means forming a passage for the flow of air between the said space and a body of air external to said container and means in the path of said flow of air for absorbing moisture from air flowing along said path in one direction and giving out moisture to air flowing in the opposite direction.

7. The combination with electrical apparatus, of a container therefor forming an enclosed space adapted to contain air, means forming a passage for the flow of air between the said space and a body of air external to said container and means in the path of said flow of air for absorbing moisture from air flowing along said path in one direction and giving out moisture to air flowing in the opposite direction.

8. The combination with electrical apparatus, of a container therefor forming an enclosed space adapted to contain air, means forming a passage for the flow of air between the said space and a body of air external to said container, fibrous material extending across the path of said flow of air for absorbing moisture from air flowing along said path in one direction and giving out moisture to air flowing in the opposite direction.

9. The combination with electrical apparatus, of a container therefor forming an enclosed space adapted to contain air, means forming a passage for the flow of air between the said space and a body of air external to said container and fragile means in the path of said flow of air for absorbing moisture from air flowing along said path in one direction and giving out moisture to air flowing in the opposite direction.

ROBERT V. BINGAY.