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SUBWAY TRANSFORMER

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Fig. 1.

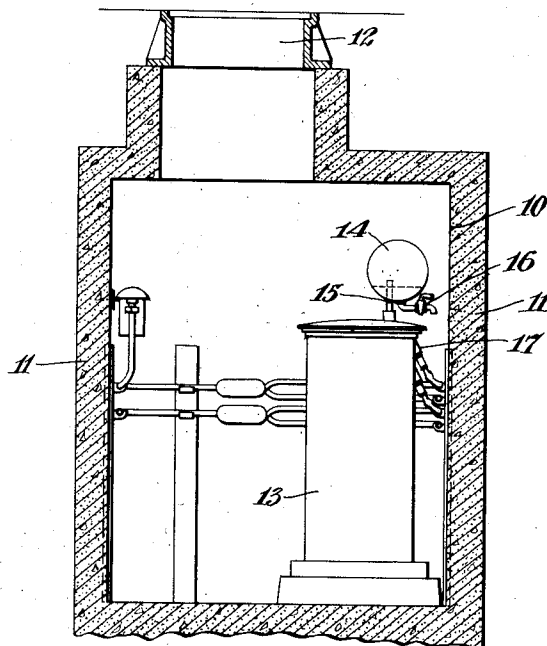
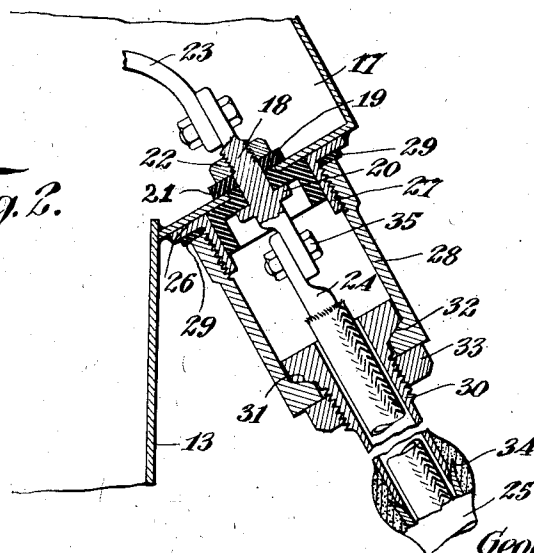


Fig. 2.



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SUBWAY TRANSFORMER

Application filed June 23, 1926. Serial No. 117,915.

This invention relates to electrical transformers of the self-cooled type submerged in oil in a tank and particularly to such transformers for use in pits below street level where they are subjected to severe space restrictions and to the liability of having the containing tank flooded with water.

With this type of transformer, the tank is usually sealed and only partly filled with oil so as to leave a space to take care of the oil expansion as the transformer heats up in service. The conductors are also brought to and from the transformer in sealed pipes and passed upward at an angle in through the side of the tank with the ends of the conductors passing on through into the interior of the tank and connected to the transformer terminals. This construction requires the tank to be opened for connection or disconnection of the conductors and to be resealed after each opening. The repeated heating of the transformer in service also tends to drive out any moisture in the oil or transformer parts and this moisture condenses and collects on the interior surface of the expansion space and drops of water are dripped back into the oil and down into the transformer apparatus where they are apt to cause a weakening of the insulation and consequent short circuit. The object of this invention is to avoid these objections and to provide a transformer of this type which will be sealed and which will not require opening for connection of the conductors, and which will avoid the dripping back of any accumulated moisture into the transformer parts.

Other objects and advantages of the invention will be apparent as it is better understood by reference to the following specification and accompanying drawings in which

Fig. 1 is a sectional view of a pit or subway within which a transformer is disposed, and Fig. 2 is an enlarged fragmentary sectional view of the fluid-tight connection of the transformer leads to the main tank.

Referring to the drawing, 10 indicates a pit or subway formed preferably by suitable walls 11 to which access may be had through a manhole 12. This manhole is usually flush with the street level from which water may

flow into the subway 10. Disposed within the subway is a transformer having a sealed main tank 13 and an auxiliary sealed tank or expansion chamber 14 mounted thereon. The main tank 13 is completely filled with an insulating liquid such as oil and the expansion tank 14 is partially filled. The expansion tank 14 is connected to the main tank by pipe 15 which extends above the bottom of the expansion tank 14 for the purpose of trapping the moisture and sediment which can be drawn off by a petcock 16 at the bottom of the tank. When the oil in the main tank expands by the heating of the transformer, it will be forced through pipe 15 into expansion tank 14 with the moisture contained therein. After cooling the oil will contract and flow back into the main tank, reducing the pressure in the expansion tank. The moisture being of a greater specific gravity than the oil will be trapped at the bottom of the expansion tank and may be drawn off through petcock 16.

Extensions 17 on the main tank 13 provide means for passing the electrical leads from the apparatus with a downward inclination, the bare terminals 18 passing through apertures 19 of the extensions. Collars 20 are provided at the central portion of the terminals beneath which is packed 21 for insulating the conductors from the metal tank. Nuts 22 threaded on the conductors securely clamp them in position in the apertures.

The inner end of the conductor 18 thus projects upward into the interior of the tank and the outer end of the conductor projects downwardly from the outside of the tank, this conductor passing through the tank wall by a sealed and insulated joint.

To the inner end of the conductor 18 is connected a lead 23 leading to the transformer. To the outer end of the conductor 18 is connected the power supply or distributing wire 24 as shown. This wire is brought to the transformer in the form of a cable with an outer lead sheath 25 and the connection to the transformer must be made fluid tight. For this purpose the lower inclined shoulder of the tank extension 17 has welded to it at 26 a flange ring 27 and a sleeve 28 is provided

screwing on to this flange ring 27 against a gasket 29 forming a tight joint. Within the sleeve 28 is an internally insulated cooperating sleeve 30 having its outer end reduced to make a joint with the lead sheath 25 while its inner end is enlarged to provide a shoulder 31 cooperating with a corresponding shoulder 32 of the outer sleeve 28.

A nut 33 is provided on the sleeve 30 and when screwed down tight presses the shoulders 31 and 32 into tight sealing engagement with each other.

In attaching the cable 24 to the terminal 18 the lead sheath 25 of the cable is cut back some distance from the end as shown. The sleeve 28 is unscrewed from the ring 27 and the nut 33 is screwed backward from the sleeve 30 so as to permit the sleeve 28 to slide backward on the sleeve 30. The projecting end of the cable 24 is thrust through these sleeves so that the reduced end of the sleeve 30 will engage the end of the lead cable 25 as shown. With the parts in this position the end of the cable can then be attached to the end of the terminal 18 after which the sleeve 28 is slid upward and screwed on to the ring 27 bringing the shoulders 31 and 32 into engagement, which engagement is tightened to a seal by the nut 33. This positions the reduced end of the sleeve 30 in close contact with the lead sheath 25 and this connection is sealed by soldering or by the usual plumbers wiped lead joint 34.

To disconnect the cable 24, it is only necessary to turn back the nut 33 and the sleeve 28 and loosen the fastening bolt 35 or other connecting means; and the cable may similarly be replaced by re-establishing the connection 35 and screwing back the sleeve 28 and nut 33.

This construction safely contains all of the current conducting parts within the protecting sheath or tank and avoids any possible contact with any outside substance or water flooding the pit in which the transformer is placed, and at the same time avoids the necessity of opening the tank in order to connect or disconnect the outside cables. The transformer tank may be completely filled with oil so that the volume of the cooling oil is correspondingly increased and the whole of the surface of the tank is used for radiation. In usual practice with the cables carried through the tank wall the cable insulation has to be kept out of contact with the body of the oil in the tank as this cable insulation is wick-like in character and tends to suck up and carry away the oil. With the cable connection of this invention, however, the oil may be safely carried up above the level of the cables without being drawn outside of the tank because there is a separation between the inside insulation and the outside insulation with an oil tight seal between the two.

The transformer of this invention thus maintains all of the parts sealed and at the

same time and without any increased space adds to the radiating area and provides a very accessible means of connecting the cables to the transformer without breaking the seal. The transformer thus remains permanently sealed as delivered on the job and the connecting of the transformer to the outside cables instead of being a troublesome job within the narrow space limits of the pit, simply involves the connection of the cables to the outwardly projecting ends of the inner connections.

I claim:

1. In combination with a casing containing electrical apparatus, a lead from said electrical apparatus extending through said casing and having a terminal on the outside of said casing, a cable, means for connecting the conducting portion of said cable to said terminal, means for forming a continuous sealed tubular means extending from said casing to the covering of said cable including means whereby said connecting means may be exposed without disconnecting the same.

2. In combination with a casing containing electrical apparatus, a lead from said electrical apparatus extending through said casing and having a terminal on the outside of said casing, and means for connecting a cable to said terminal including a detachable bolt for fastening the conducting portion of said cable to said terminal and a unitary detachable sleeve connected at one end to said casing, and means for fastening said sleeve at the other end to said cable whereby the conducting portion of said cable and said terminal are protected.

3. In combination with a casing containing electrical apparatus immersed in oil, a lead from said electrical apparatus passing through and sealed in a wall of said casing below the oil level, said lead having a terminal on the outside of said casing, a cable, means for connecting the conducting portion of said cable to said terminal, means for forming a continuous sealed tubular means extending from said casing to the covering of said cable including means whereby said connecting means may be exposed without disconnecting the same.

4. In combination with a casing containing electrical apparatus, a lead from said electrical apparatus extending through said casing and having a terminal on the outside of said casing, a sheathed cable, means for connecting the conducting core of said cable to said terminal, means forming a continuous sealed tubular means with said cable sheath extending to and connected to said casing, said tubular means including telescoping tubes one of which is fastened to said cable sheath and the other of which is detachably fastened to said casing, one of said tubes having an outwardly extending flange and the other an inwardly extending flange, said

outwardly extending flange being disposed within the larger of said tubes and coacting with said inwardly extending flange, and means for forcing said flanges against each other to form a sealed joint.

5 5. In combination with a casing containing electrical apparatus, a lead from said electrical apparatus extending through said casing and having a terminal on the outside
10 of said casing, a sheathed cable, means for connecting the conducting core of said cable to said terminal, means forming a continuous sealed tubular means with said cable sheath extending to and connected to said
15 casing, said tubular means including tubes telescopically slidable on each other one of which is fastened to said cable sheath leaving said connecting means exposed and the other of which is detachably fastened to said
20 casing and encloses said connecting means when fastened to said casing.

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