INSTRUCTIONS

PRECIPITATION TRANSFORMER

Core and Coils

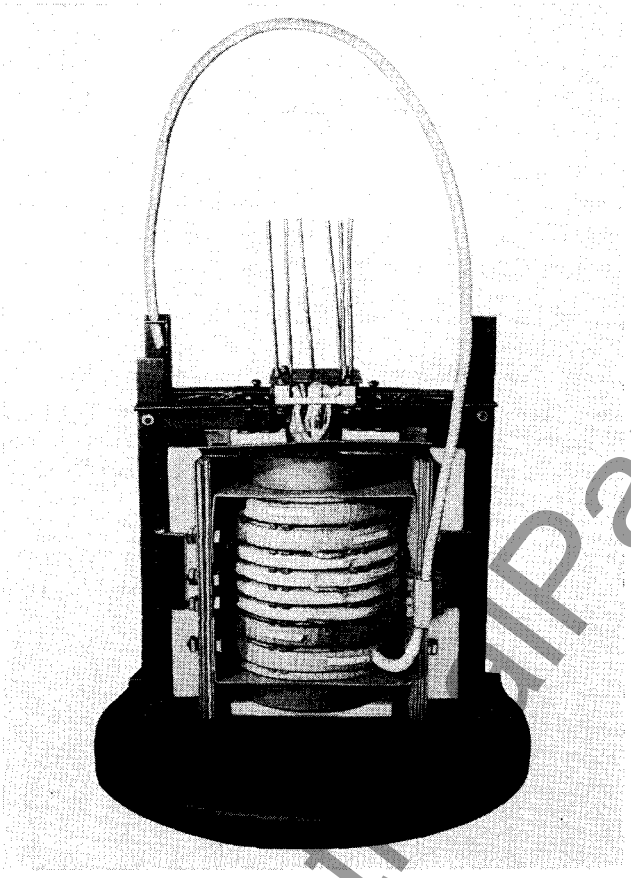

FIG. 1. View of Precipitation Transformer Round Wire Core and Coils

THE CORE AND COILS of a 25 kva, 75000 high-voltage, 480 low-voltage single phase, 60 cycle, Westinghouse Type SL precipitation transformer is shown in Fig. 1.

This type of high-voltage winding is clearly shown in Fig. 1. It is the round wire pancake type of winding with shielded coils at the line ends.

The low-voltage winding is of the cylindrical type with leads brought up inside the coil. The low-voltage winding is not visible in Fig. 1.

Another type of winding used is the Lowgrocap winding shown in Fig. 2.

End Frame Structure. The bottom end frames consist of steel angles bolted to the bottom plate. The core and coils are lowered into place and the top end frames bolted on. The windings are properly located with respect to core by means of pressure blocks at the top and bottom. Pressure screws in the top end frames clamp coils in place.

Provision for centering the case on the end frames is made at extreme top of the vertical end frames. This consists of a small gusset plate with a hole in it welded inside the vertical angle. The hole takes the centering pin on underside of case top.

Windings. The low-voltage winding is of the cylindrical type which is normally used on voltages of the 8.7 kv class or less. The cylindrical coil consists of one or more layers wound on a Micarta cylinder. Each conductor consists of a number of copper straps in parallel which are transposed to minimize eddy current losses. Micarta collars, cut to fit the winding, are placed at the ends of the layers. These collars provide the necessary electrical and mechanical strength. Ducts are provided around and through the coil so cooling liquid can circulate effectively.

Taps are taken from the low-voltage winding in such a way as to preserve the magnetic balance of the windings as much as possible. Usually taps are brought off the inner layer which has very little effect on the magnetic balance of the windings.

The high-voltage winding is wound with single conductor round wire, having cotton and enamel insulation. The wire is wound in pancake form on Micarta foundation tubes with crimped paper layer insulation. The pancake coils are stacked using press board spacers as separators. The spacers provide insulation and cooling for the high-voltage column.

The Lowgrocap windings are modified cylindrical coils. The difference consists of a static cylinder next to the line layer which distributes the stress uniformly over the first layer of the coil. Static cylinders are made of two layers of pressboard, between which is a layer of copper foil. This is wrapped up into an open cylinder next to the line

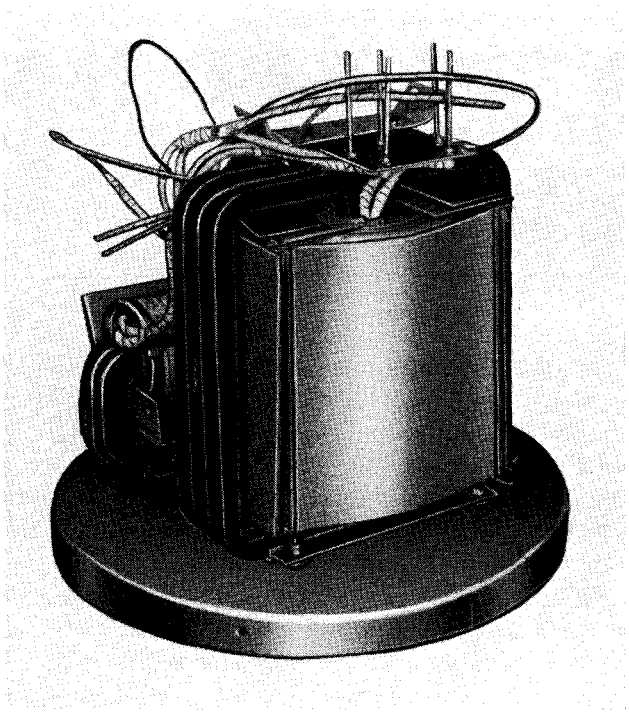

FIG. 2. View of Lowgrocap Type Winding

layer of the coil, and the foil is connected to the line lead. Insulation between static cylinder and the coil layer is the same as the insulation between layers.

Insulation. The arrangement of barriers and insulation is shown in Fig. 3. All sharp corners on core and end frames are protected by barriers. The ends of the high-voltage windings are protected by static shields and barrier head sheets.

The major insulation of the Type SL precipitation transformer consists of insulating cylinders of pressboard and oil ducts between high and low windings. The oil ducts are so proportioned as to allow oil to flow naturally across at least one side of all turns.

Assembly of Windings. Coils of cylindrical type require no further individual assembly after winding.

Round wire pancake coils are assembled in stacks on their insulating cylinder. They are separated from the cylinder by vertical insulating spacers and from each other by radial insulating spacers dovetailed onto the vertical spacers. The stack, while hot, is pressed to size axially after which it is ready for assembly on the core.

The high and low-voltage windings are assembled concentrically on the core with the low-voltage winding nearest the iron. The low-voltage winding is centered on the core by means of four maple rods driven tightly into four corners of the cruciform center leg. The rods are driven between core and low-voltage insulating cylinder and are driven down far enough so as not to extend above the gap in type "C" core. The top yoke pieces of the type "C" core are placed in position over top of coils and banded into place.

The high-voltage winding is separated from the low voltage winding by a cylinder, usually of pressboard. Insulating collars at the ends of the coil columns transmit the clamping pressure to the coil columns.

All leads have been kept short which results in simple and foolproof design. Complicated supporting structures are unnecessary.

Treatment. No varnishes, gums, or similar compounds are used for coil treatment, thus assuring freedom from surface coating which might prevent proper oil impregnation.

After assembly, the core and coils are preheated, then thoroughly dried under vacuum in a heated oven. While still hot and under vacuum, they are impregnated with transformer oil. The cases of Westinghouse precipitation transformers are suitable for filling under vacuum following complete assembly.

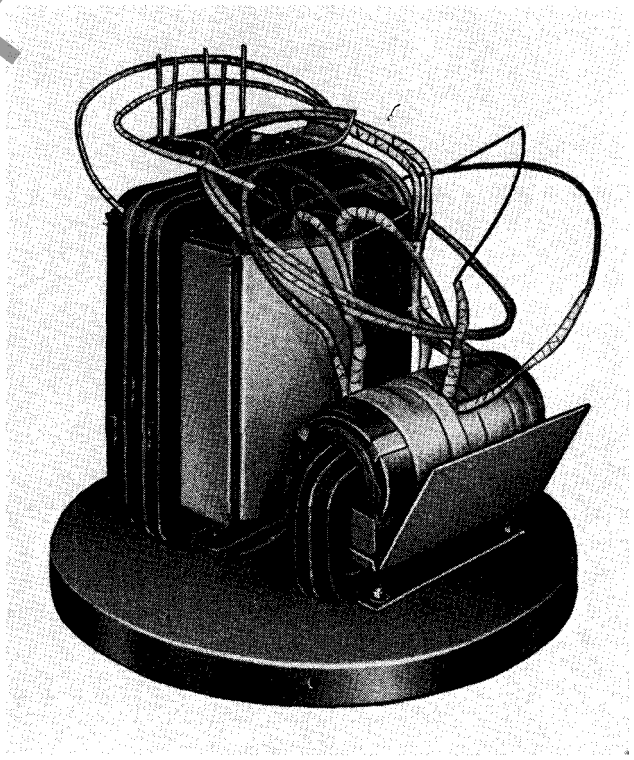

FIG. 3. View Showing Arrangement of Barriers and Insulation

Cores. The magnetic circuit of the Type SL precipitation transformer will usually be of the wound type "C" construction. This construction is especially suited to grain oriented steels such as these cores as no crossgrain flux path is presented. Cores are strain annealed after winding. Following annealing, the cores are bonded with bonding compound and the gap machined through the core. The gap surfaces are then polished and etched free of burrs. This results in a core relatively easy to assemble or take apart.

Hancing and Bracing. The core and coils, end frame and case bottom are lifted as a unit by applying crane hooks to the welded cross bar at top of end frames.

The end frames are arranged so that no clamping pressure is placed on the core. The core is cradled in the end frames and the top core yoke is held only by the steel banding strips and thermal setting gap compound. This prevents the gap from being pulled open by clamping pressure from the end frames.

Figs. 1 and 2 of this instruction leaflet show how the core and coils appear after the case has been removed in accordance with procedure described in I.L. 44-640-2.

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