OPERATION • MAINTENANCE

INSTRUCTIONS

INERT-ARC WELDED BUSHING

Type "RFW"

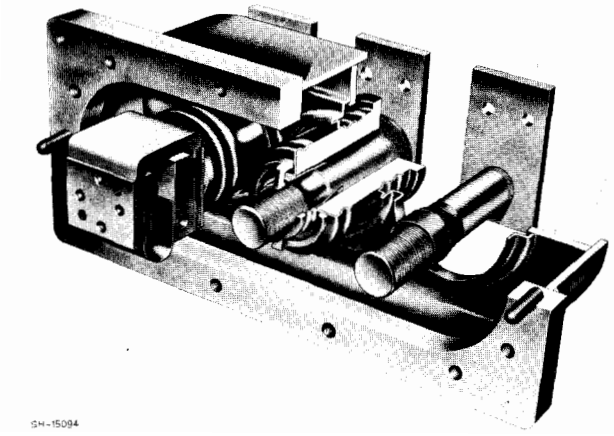

FIG. 1. Cut-away view of Type "RFW" Bushing

GENERAL

Inert-arc welded bushing, type "RFW" is of the type where the two seals of stud to bushing cap and bushing flange to mounting surface are by means of inert-arc welds. See Figure 1.

This method is accomplished by a rolled flange as shown in Figure 2. The copper bushing cap and flange are attached to the porcelain by being rolled into grooves in the porcelain over silicone rubber "Silastic" rings. This seal is made at the factory and cannot be repaired in the field. If the intermediate seal is defective, replacement bushings must be obtained from the factory.

INERT-ARC WELDING

Inert-arc welding is a D.C. electric-arc welding process in which the metal joining is accomplished in an atmosphere of inert gas so as to prevent oxidation of the weld. Where the two metals joined are copper, the inert arc gas used is helium.

This method of welding is ideally suited for the mounting of bushings as its high concentration of localized heating gives a quick weld while at the same time it does not cause excessive overheating to adjacent "Silastic" seals.

Repair of Leaks to Inert-Arc Welded Bushings. If there is a leak at the welded joints, it may be repaired by sealing it with solder.

This may be done using the following procedure:

1. Wrap wet asbestos packing or cord around the porcelain to protect intermediate seal from excessive heat.

2. Clean the point of leak by filing with the corner of a three square file.

3. Preheat welded joint at point of leak to about 350°F with an oxy-acetylene torch (a). A stick of solder (60-40) (b). Will flow at about this temperature.

4. Apply solder and acid flux to joint at point of leak, playing flame on the welded joint and never on the porcelain or intermediate seal.

5. Allow to cool and rinse thoroughly to remove residual flux. Test for tightness by applying 7 p.s.i. pressure to the transformer tank.

If the leak is at the intermediate seal or if the bushing is damaged, the old bushing must be removed and replaced with a new one according to instructions below.

Removal of Bushings. For both removing and replacing inert-arc welded bushings, the following

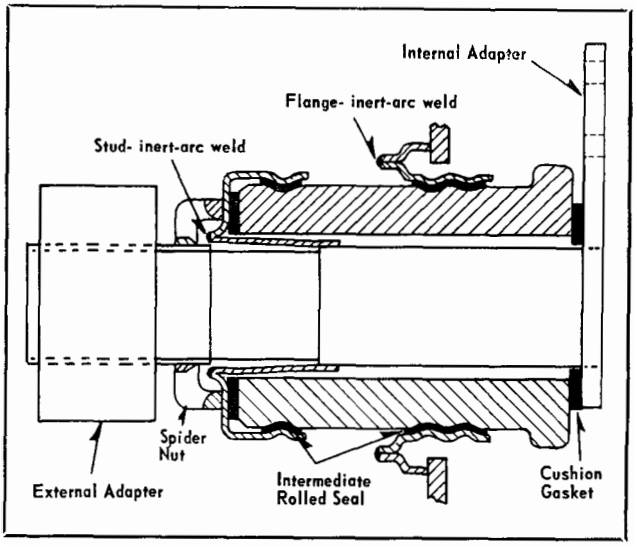

FIG. 2. Rolled Flange Bushing

instructions should be carefully followed step by step to insure that no damage is done to the bushings and mounting surface and that a pressure tight welded joint is accomplished.

1. Remove outer adapter and spider nut by unscrewing from the stud.

2. The design shown in figs. 1 and 2 is of the type where the porcelain only is removed and the bushing stud is used with the new porcelain. It is, therefore, not necessary to have access to the inside of the tank for disconnecting the stud.

3. The inert-arc welds are about 1/16" thick and can be broken by filing or cutting. One method recommended is to use a high speed rotary file to cut through the weld (c). Care should be taken not to remove an excessive amount of the flange and cone as there must be sufficient material left for welding in the replacement bushing. If after removing $\frac{3}{32}$" to 1/8" of weld, the bushing does not appear to be free, a strong tug will usually dislodge it as the welding process tends to contract the two copper pieces together and have them appear solid.

4. After the weld is broken, remove porcelain from stud.

Replacement of Bushings. Since the intermediate bushing seals used on the solder sealed and rolled flange seals are essentially low temperature seals, it is important to handle these types of bushings with extreme care.

If the operator is not familiar with the inert-arc welding process, it is recommended that he practice on similar pieces of copper before attempting to install a bushing.

The following procedure is recommended as the safest and best means of installing these bushings:

1. Before sliding porcelain over bushing stud, dress bushing flange lip and end of copper cone on stud so as to be smooth and level. The mating surfaces to be welded must be clean.

2. Check to see that the cushion gasket is in place on stud. Slide porcelain over stud.

3. Push the porcelain against the cushion gasket and pull up snug using "spider" nut provided. When tightening nut on rolled flange bushing be certain that porcelain does not turn with respect to stud.

4. Before welding, copper parts to be welded together should be a snug fit. If necessary to insure this, peen parts together with small hammer.

5. Wrap wet asbestos packing or cord around the porcelain to protect intermediate seals from excessive heat.

6. First, weld bushing to tank flange by inert-arc method using helium gas. (d) No filler rod or flux is necessary. Fuse parts together moving as quickly as possible along the weld. Deep weld penetration is not necessary or desirable. The less time consumed in making the weld will afford better protection to the intermediate seal.

7. After welding bushing to tank flange, make stud to bushing weld. It will usually be found easier to make two or three small spot welds through "spider" nut first to hold the bushing and stud together. Then the nut can be removed and the weld completed.

8. After all welded joints have been allowed to cool, test the joints for tightness by applying 7 p.s.i. pressure to the transformer tank.

9. If there is a leak in the welded joint, it will usually be better to seal it by soldering according to the instruction given previously.

10. After testing, restore spider nut drawing up snug and put on external adapter.

NOTES

(a) Oxy-acetylene equipment consists of a torch, hose, Oxygen Regulator, Acetylene Regulator, and cylinders of O_2 (oxygen) and C_2H_2 (acetylene). These can be obtained from any reputable supply house such as National Cylinder and Gas Company, Airco, or Linde Air Products Company.

(b) A commercial 60-40 solder is recommended having 60% tin and 40% lead and melting at approximately 358°F.

(c) A high speed rotary file, size 3/16 x 1/2, shape C with radius end, is recommended. Such files can be obtained from any tool supply firm.

(d) Inert-arc equipment from National Cylinder and Gas Company, Airco or Linde Air Products Company. 300 ampere D.C. Welder.

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