Apparatus

HIGH RESISTANCE ELECTRICAL LEADS FOR HIGH PRESSURE APPLICATIONS*

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*This work was sponsored in part by the Air Force Office of Scientific Research under Contract AF49(638)-790 and the U.S. Atomic Energy Commission under Contract AT(11-1)-1041

Epoxy and similar substances have been used for some time in the making of electrical lead-ins for high pressure apparatus.[1,2,3] It has been found that an extremely simple type of epoxy electrical lead-in gives a very high resistance between the electrical lead and the high pressure apparatus. The resistance at room temperature is infinite as measured on a General Radio type 544B megohm bridge. At 50° C. the resistance is 10^{12} ohms; at 100° C., 2×10^{11} ohms; and at 150° C., 5×10^{10} ohms. Work with an internal furnace shows that the resistance of these lead-ins changes very little when the internal temperature of the furnace is increased to 250° C. These epoxy lead-ins are of particular use when the leakage current through the lead-in is of importance. A diagram of these cones is shown in Fig. 1.

The cones are made from Eccobond 76 epoxy in hardened tool steel (Rockwell 40 C). The cones are constructed by placing a taut copper wire, which passes through the alumina insulator, up the middle of the cone in the apparatus plug. The apparatus plug is then heated by means of a heat gun until the epoxy flows freely. The epoxy is then applied as shown making sure that no air pockets are left in the cone. After being allowed to cool to room temperature the plug is cured for three hours at 110° C. and for three hours at 150° C.

These cones have been used in a liquid system at temperatures from 20° C. to 120° C. at pressures up to 10,000 atm. for short periods of time and at pressures up to 8,000 atm. for up to eighty-two hours with very good results. Preliminary tests indicate that the longevity of these electrical lead-ins is good.

The repair of a damaged cone is quite simple as the old cone can be removed in about five minutes by using a coning tool and replaced in exactly the same manner as a new cone is made without touching any of the remaining undamaged cones.

REFERENCES

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2. Lazane, F., J. Phys. Radium 14, 213 (1953).

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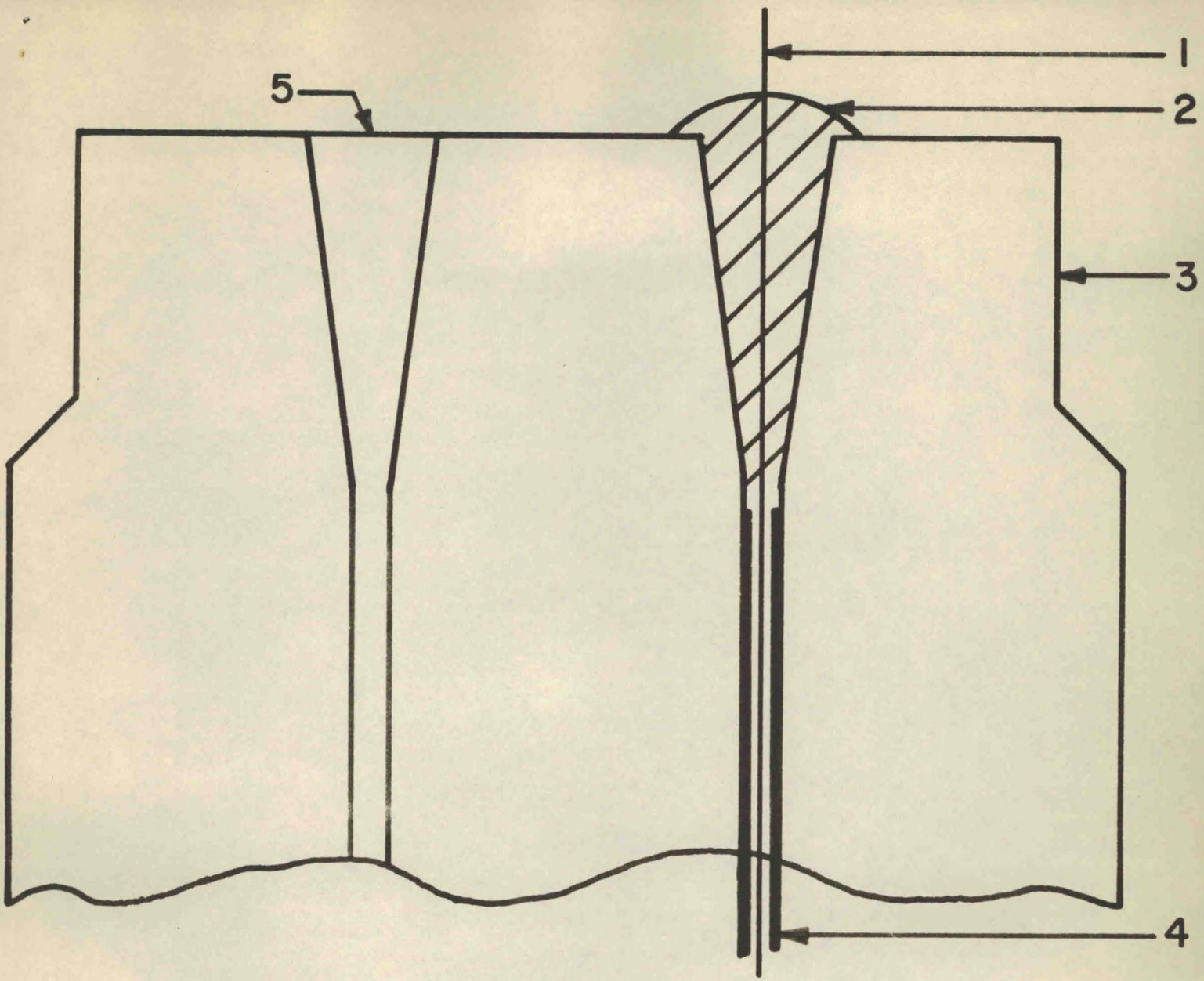
Fig. 1. Diagram of epoxy resin electrical seal.



1— COPPER WIRE

2— EPOXY

3— APPARATUS PLUG

4— ALUMINA INSULATOR

5— 1/16" HOLE COUNTERSUNK
16° TO ABOUT .165 DIA.