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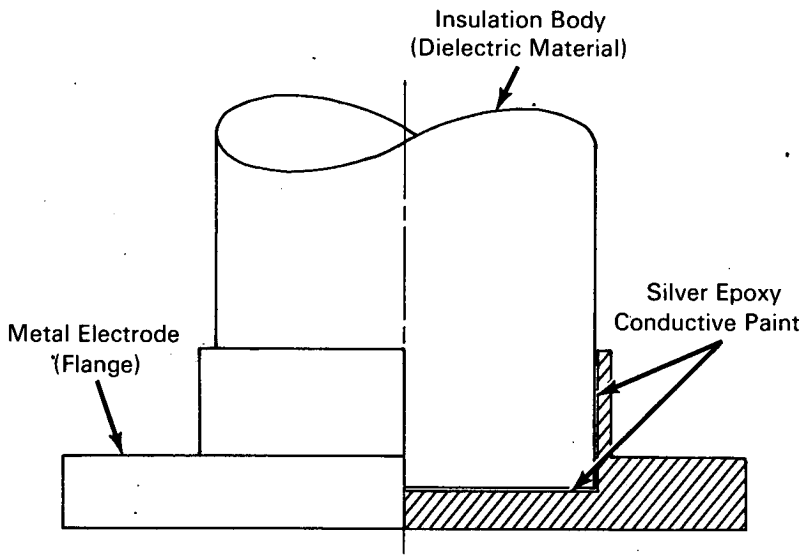
NASA TECH BRIEF

Technique Eliminates High Voltage Arcing at Electrode–Insulator Contact Area



The problem:

High-voltage (600,000 volts dc) electrodes supplying electrical power to vacuum facilities may fail at the electrode–insulator contact area due to arcing across microscopic surface irregularities. When high-voltage electrical current is imposed on the electrode, electrical fields are created in the microscopic surface irregularities at the electrode–insulator contact face. Entrapped gases, particularly on the insulator interface, form a conductive path for electrical arcing. Previous methods to resolve this problem utilized highly polished contact surfaces, insulators molded to the electrodes, etc. These methods were fairly complicated to accomplish and were costly.

The solution:

Coat the electrode–insulator contact area with silver epoxy conductive paint and force the electrode and insulator tightly together into a permanent connection.

How it's done:

An electrode–insulator connection is designed as a socket fitting. The two mating parts are fabricated with the inside diameter of the female part 0.003 inch less than the outside diameter of the male part. The male part is shrunk by cooling in liquid nitrogen, the mating surface of the female part is painted with silver epoxy conductive paint, and the two parts are joined. As the male part expands in warming up to ambient temperature, the silver epoxy conductive paint is forced into the surface irregularities of both parts and fills them completely. The result is complete and uniform surface contact.

(continued overleaf)

Notes:

1. High mechanical strength and intimate contact at the electrode-insulator junction are derived by this method; however, the dielectric material of construction for the insulator must be capable of withstanding compression loads such as those applied by the press fit procedure described.
2. Insulators treated in this manner have been operated at 250,000 volts. An insulator feedthrough for one research facility was successfully tested at potentials of 600,000 volts from vacuum to atmosphere pressure.
3. Inquiries concerning this innovation may be directed to:

   Technology Utilization Officer
   Lewis Research Center
   21000 Brookpark Road
   Cleveland, Ohio 44135
   Reference: B67-10470

Patent status:

No patent action is contemplated by NASA.

Source: Glenn Mealy
(LEW-10133)