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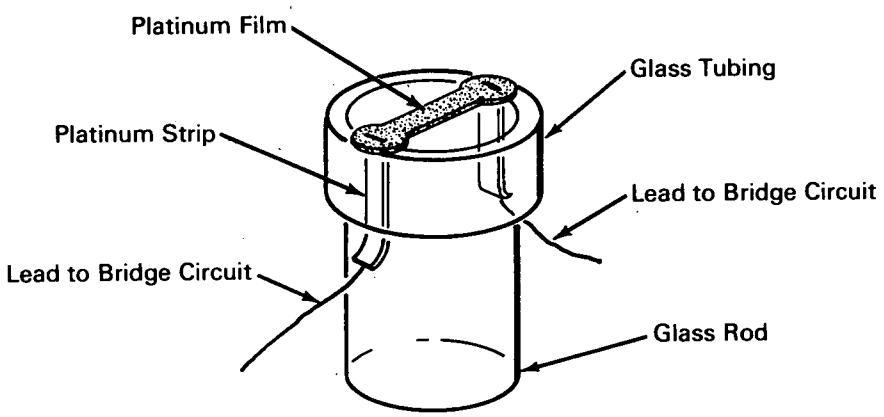
NASA TECH BRIEF

Thin-Film Gage Measures Low Heat-Transfer Rates



The problem:

To measure low heat-transfer rates (less than 2 Btu/ft²/sec) in order to determine the transition between laminar and turbulent conditions in the boundary layer surrounding slender and moderately slender cones under test in a hypersonic blowdown helium tunnel. The low heat-transfer rates create a measurement sensitivity problem and preclude the use of thermocouples.

The solution:

A heat-transfer gage consisting of a thin layer of vacuum-evaporated platinum, which acts as a resistance thermometer, on a heat-resistant glass substrate that is contoured to fit the model surface.

How it's done:

Close-fitting pieces of the glass tubing and rod, with two diametrically opposed platinum foil strips embedded between them, are fused together to form the substrate. The substrate is ground and polished to fit the model on which it is to be installed. The thin platinum resistance element is then vacuum-evaporated onto the substrate across the exposed ends of the embedded platinum strips. The gage is then calibrated and installed in the model. When the gage is connected as the active arm of a bridge circuit it produces a voltage proportional to the temperature of the glass surface.

Notes:

1. The gage has a wide dynamic range and a rapid response time.
2. Inquiries concerning this innovation may be directed to:

   Technology Utilization Officer
   Langley Research Center
   Langley Station
   Hampton, Virginia, 23365
   Reference: B66-10180

Patent status:

No patent action is contemplated by NASA.

Source: Cary R. Spitzer
(Langley-205)

Category 01