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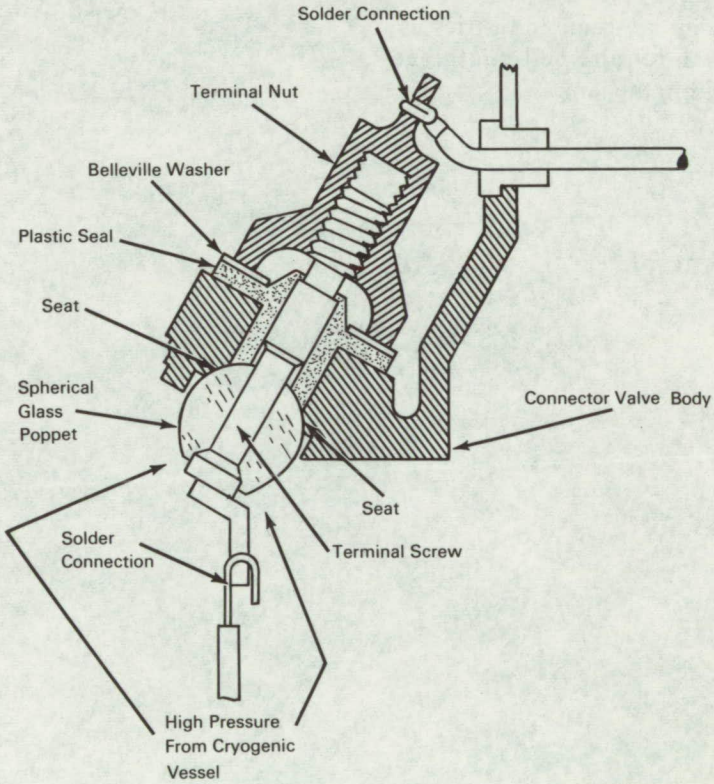
Brief 66-10079

NASA TECH BRIEF

High-Pressure, Low Temperature Electrical Connector Makes No-Leak Seal



The problem:

In many cases, cryogenic liquids must be valved to control their flow, and generally it is desirable to use an electrically-activated solenoid-type valve. In previous designs an electrical conductor has been hermetically sealed to a glass bead, and the glass bead has been hermetically sealed to the valve body. Normally, the glass and electrical conductor could be matched for contraction characteristics but because of the small size of the glass bead, it could not then be contraction-matched to the valve body. Invariably the body material and the glass bead had different coefficients of thermal contraction; thus, cryogenic cooling produced stress breaks with resultant gas leaks.

The solution:

An electrical feed-through connector, with design and structure such that extremely high pressures and low temperatures contribute to the sealing properties of the device.

(continued overleaf)

How it's done:

A spherical glass poppet is molded with an integral beryllium-copper terminal screw. When assembled in a connector body seat that has been lapped for zero leakage, the poppet is held firmly seated by pressure from the cryogenic vessel. Additional seating force provided by tightening the beryllium-copper terminal nut helps prevent leakage at the poppet. A plastic seal provides a tight fit about the terminal screw. The plastic has a tendency to shrink at cryogenic temperatures; thus, the fit about the terminal screw will become tighter as the temperature lowers, effecting a better seal. The Bellville washer compensates for cold flow in the plastic seal by deflection action of the washer; a characteristic of Bellville washers is that a lesser deflection will result in greater loading.

Notes:

1. This device is applicable in cryogenic industries using storage vessels which require self-contained electrical connections within the tank.
2. The device could also be used in refrigeration systems requiring electrical connections which must withstand environments having greatly varying temperatures.
3. Inquiries concerning this innovation may be directed to:

   Technology Utilization Officer
   Manned Spacecraft Center
   P.O. Box 1537
   Houston, Texas, 77001
   Reference: B66-10079

Patent status:

Inquires about obtaining rights for the commercial use of this invention may be made to NASA, Code GP, Washington, D.C., 20546.

Source: John F. Weakley
of North American Aviation, Inc.,
under contract to
Manned Spacecraft Center
(MSC-276)