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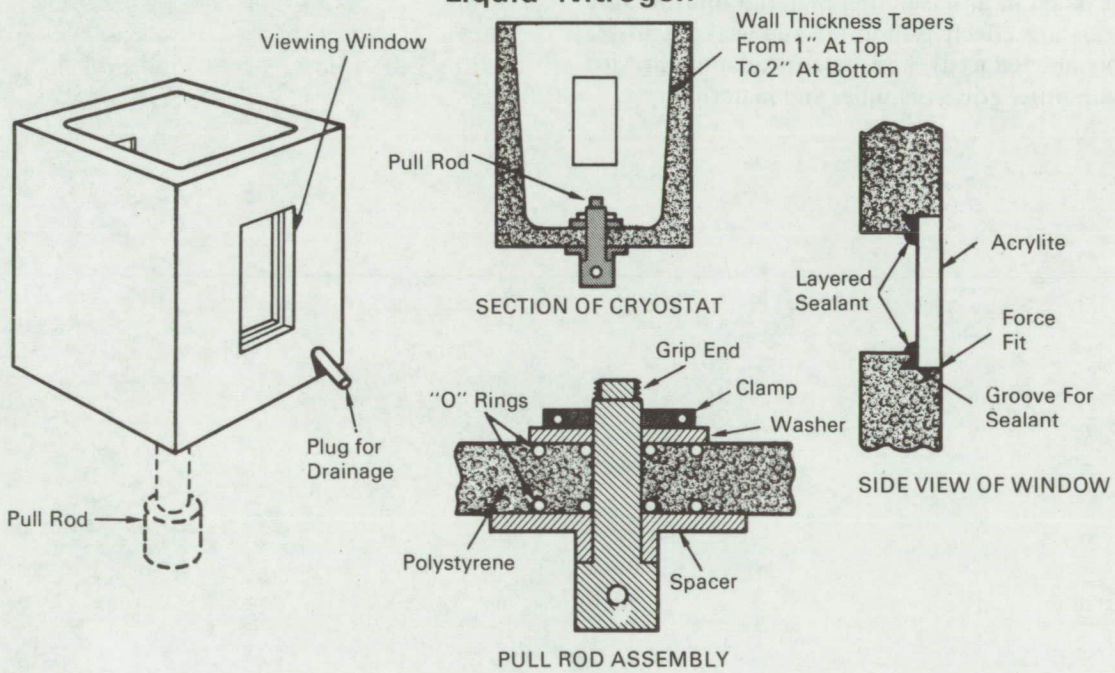
Polystyrene Cryostat Facilitates Testing Tensile Specimens under Liquid Nitrogen



The problem:

In testing irradiated tensile specimens under liquid nitrogen, a slight eccentricity in the tensile system will cause erroneous results. A conventional metal-type cryostat not only adds eccentricity to the system because of its weight, but also makes it difficult to ascertain when a test specimen is properly seated.

The solution:

A lightweight cryostat made of expanded polystyrene. The lightweight cryostat is attached directly to the tensile system by a special seal, reducing misalignment effects due to cryostat weight, and facilitates viewing and loading of the specimens.

How it's done:

The cryostat is made of expanded polystyrene (1 lb/cu ft density) and is much lighter than the conventional metal cryostats. The light weight allows it to be attached directly to the bottom pull rod of the tensile testing mechanism without eccentricity problems and eliminates the need for complicated dynamic seals. The material itself is an excellent insulator and is nonporous. A thin layer of a room-temperature-curing silicon adhesive painted on the interior and exterior of the cryostat increases the resistance of the material to LN_2 and keeps moisture out of the foam. The low density material is not subject to damaging thermal stresses. Two acrylite windows are

(continued overleaf)

incorporated in opposite walls of the cryostat, permitting excellent view of the specimen and grips. The windows and pull rod assembly are sealed with the silicone adhesive; O-rings are also used in sealing the pull rod. The sealant is effective when used sparingly or when put on in separate layers.

Notes:

1. The system has been filled with LN_2 and emptied (by removal of a drain plug) many times without detrimental effects. Advantages of the cryostat include: simplicity of design (there are no moving seals or complicated assemblies); light weight; economy and ease of fabrication (all the materials necessary are common, and the polystyrene can be easily shaped with a hot wire cutter in the form of a loop); economy of LN_2 use (because the cryostat is made of an insulating material and because the seals are effective, boil-off and leakage losses of LN_2 are reduced); and ease of adaptability for use with other grip assemblies and materials.
2. Inquiries concerning this innovation may be directed to:

   Technology Utilization Officer
   AEC–NASA Space Nuclear Propulsion Office
   U.S. Atomic Energy Commission
   Washington, D.C. 20545
   Reference: B67-10613

Patent status:

No patent action is contemplated by AEC or NASA.

Source: R. P. Shogan and R. J. Skalka
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