IMPROVED ELECTRICAL LEADS FOR HIGH PRESSURE SYSTEMS

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Electrical connections from the interior of a pressure vessel to atmospheric pressure typically place many design constraints on high pressure experimentation. A simplified version of older techniques using the cone seal⁽¹⁻³⁾ has proven itself repeatedly in both gas and liquid systems with high reliability and ease of fabrication. Previous cone sleeves were made of oil soaked pyrophyllite, ivory and bone as well as certain plastics. All of these sleeves were made by careful machining to very close tolerances. Such machining was a considerable challenge (as well as being time consuming) and is completely eliminated in the technique described here.

The present procedure utilizes heat shrinkable Kynar⁽⁴⁾ (or other) plastic tubing as illustrated in Figure 1. The top diameter of the cone is 0.400cm and the cone angle measured from the axis is 16°. The Kynar tubing should have an internal diameter either equal to or slightly less than the maximum cone diameter. The initial wall thickness of the tubing is 0.012cm. The tubing is slipped or pulled over the cone as in (b) and shrinking is performed routinely with a heat gun to yield the completed sleeve as shown in (c).

The wire leads may pass completely through the cone for applications where thermoelectric junction effects are to be avoided. In this case the wire is soldered in. For other appli-

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cations a shallow hole is drilled in each end of the cone and the two lead wires are soldered in these holes.

The Kynar tubing has under ordinary conditions an operating range for long term service of -55 to 175°C and short term capabilities (1 hour) at 375°C. Our primary applications of these seals, however, has been at room temperature and to 10kbars. No seal has needed replacement for a period of five years involving a huge number of cycles.

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REFERENCES

1. P. W. Bridgman, Physics of High Pressure (G. Bell and Sons, London, 1949), p. 52.
2. T. A. Scott, Rev. Sci. Instr. 36, 99 (1965).
3. D. S. Tsiklis, Handbook of Techniques in High Pressure Research and Engineering, (Plenum Press, New York, 1968), p. 258.
4. Kynar is a trade name for a semi-rigid high temperature polyvinylidene fluoride tubing which is manufactured by Rayclad Tubes, a subsidiary of the Raychem Corporation. We obtain our supplies from Deanco, Inc., Ithaca, N.Y.

LEGEND FOR FIGURE

- Figure 1: (a) Cone with electrical leads and heat shrinkable tubing.
- (b) Tubing pulled over cone.
- (c) Plastic sleeve shrunk in place.

(a)

(b)

(c)