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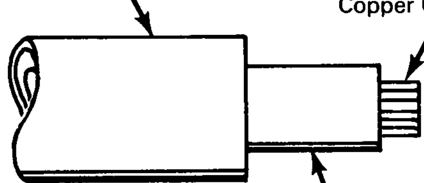
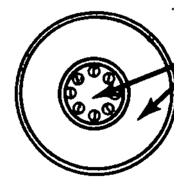
Double Copper Sheath Multiconductor Instrumentation Cable Is Durable and Easily Installed in High Thermal or Nuclear Radiation Area





The problem:

It was required to provide a double sheathed multiconductor instrumentation cable in a moist, vibratory, and hazardous environment in lengths up to 100 ft. These cables were to be integrally connected to transducers mounted on the test piece, and operate at optimum efficiency unattended for 1 year or more. In addition, it was a requirement that grounding connections be made at one end of the cable because accidental grounding along the length was prohibited. No commercially available double sheathed, multiconductor cables existed that would satisfy these requirements.

The solution:

A cable in which the conducting wires are routed through two concentric copper tube sheaths, employing a compressed insulator between the conductors and between the inner and outer sheaths.

How it's done:

Copper wire conductors are threaded through preformed magnesium oxide beads which in turn are placed inside a copper sheath of the appropriate diameter and length. This assembly is then drawn or swaged to compress the magnesium oxide. It is then annealed to relieve any work hardening that might have occurred. The assembly is then placed inside a larger diameter copper tube and additional preformed magnesium oxide beads are placed between the tubes. The drawing, swaging, and annealing process is then repeated to produce the finished product. The inner sheath becomes the grounding conductor at the preselected end, and the outer sheath acts as a durable protective barrier against moisture, abrasion, and vibration.

Notes:

1. The double sheath construction acts as an instrumentation noise barrier and virtually eliminates "ground loop".
2. The selection of copper makes installation (bending) easier and overall costs are reduced as compared to stainless steel or other conventional materials. Magnesium oxide was the selected insulator because of its superior electrical characteristics at high temperatures.

(continued overleaf)

3. 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: B67-10538

Patent status:

No patent action is contemplated by AEC or NASA.

Source: A. W. McCrae, Jr.
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AEC–NASA Space Nuclear Propulsion Office
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