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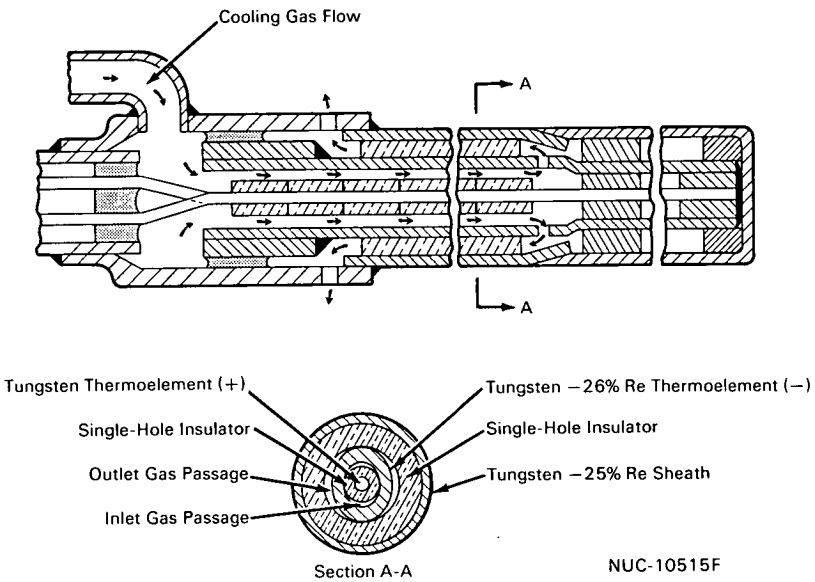
High Temperature Thermocouple Design Provides Gas Cooling without Increasing Overall Size of Unit



The problem:

The number of materials available for use in thermocouples to measure temperatures above 4000°R is quite limited, and insulating the thermoelements is extremely difficult since most materials begin to ionize or become semiconductors at these temperatures. Previous cooling designs required extra space to accommodate a tube to carry the coolant or a split tube with a separator to channel the gas.

The solution:

A thermocouple utilizing a thermoelement of noncircular cross section with insulation of circular cross section to provide space for coolant flow.

How it's done:

This thermocouple design employs an elliptically shaped tungsten–rhenium tube as a negative thermoelement and a round tungsten wire as the positive element. Insulators of circular cross section are used between the elements, thus providing a path for the flow of coolant gas down the probe. A similar arrangement of insulators between the tungsten–rhenium tube and the outer sheath provides the return path. Several small holes are drilled near the hot end to allow gas to flow through the tungsten–rhenium thermoelement wall. The direction of the gas flow could, of course, be from the outer sheath to the inner sheath if dictated by design conditions. The direction of flow is not a controlling factor.

A corollary to this design would be to use thermoelements of circular cross section with insulators of noncircular cross section. This approach would

(continued overleaf)

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probably require more space for the same relative performance as the unit described above.

Notes:

1. This development is in the conceptual stage only, and, as of date of publication of this Tech Brief, neither a model nor prototype has been constructed.
2. Inquiries concerning this invention may be directed to:

   Technology Utilization Officer
   AEC-NASA Space Nuclear Propulsion Office
   U.S. Atomic Energy Commission
   Washington, D.C. 20545
   Reference: B67-10497

Patent status:

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

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