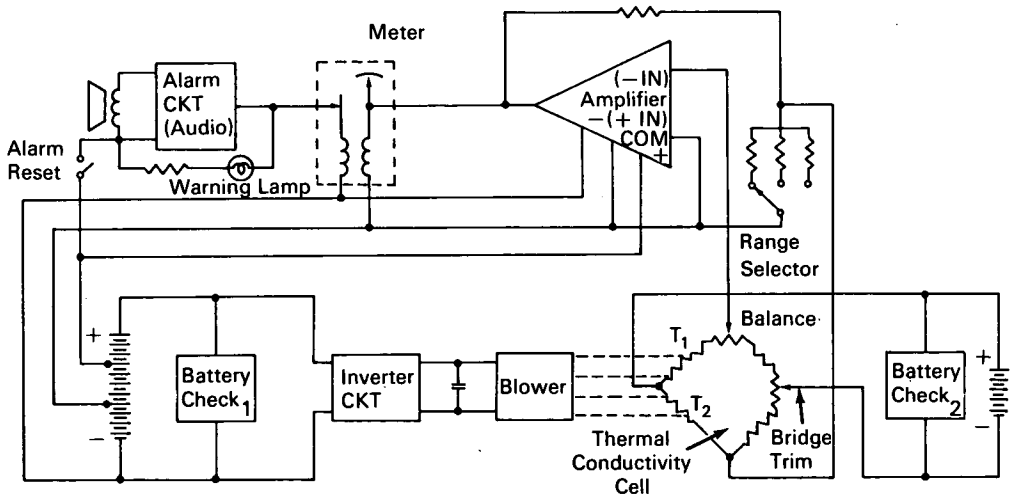
NASA TECH BRIEF

Portable Detector Set Discloses Helium Leak Rates



The problem:

In detecting leaks in closed fluid systems, soap solutions, mass spectrometers, or special devices sensitive to a specific gas, are not effective in all applications. The use of common tracer gases has posed problems involving safety or contamination or both.

The solution:

Use of the inert gas helium as a tracer is made possible by the development of a portable helium detector that will measure helium leak rates from 1×10^{-3} to 1×10^{-6} cc/sec.

How it's done:

Operation of the gas detector unit is based on a comparison of the thermal conductivity properties of various gases. A thermal conductivity cell consisting of two constantly driven thermistors in a balanced bridge circuit, provides the medium by which the presence of gases having thermal conductivities different from that of the ambient is detected. The thermistors are matched and identically driven so that, with both exposed to the ambient, the bridge output is null. When either of the thermistors, T_1 or T_2, is exposed to a gas whose thermal conductivity differs from that of the ambient, that thermistor's resistance value changes, unbalancing the bridge circuit to produce a voltage that drives the meter, which is calibrated to read directly the equivalent cc/sec leak rate of the helium gas in the ambient air. A blower system is used to pull the ambient through sampling tubes containing the thermistors at a constant rate. One of the sampling tubes connects with an external fitting that accommodates three different probes: a gross leak probe to detect a relatively large concentration of helium in the ambient; a rigid pinpoint probe to locate the helium leak source; and a flexible pinpoint probe to locate helium leak sources in less accessible locations.

(continued overleaf)

Notes:

1. The unit is a hand-held detector with its own battery pack (supported by an operator-worn strap) weighing only 7.7 lbs.
2. Appropriate calibration of the meter would permit the use of this device for detection of gases having a relatively wide range of thermal conductivities.
3. Inquiries concerning this innovation may be directed to:

   Technology Utilization Officer
   Marshall Space Flight Center
   Huntsville, Alabama 35812
   Reference: B67-10065

Patent status:

No patent action is contemplated by NASA.

Source: G. E. Anderson
of North American Aviation, Inc.
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