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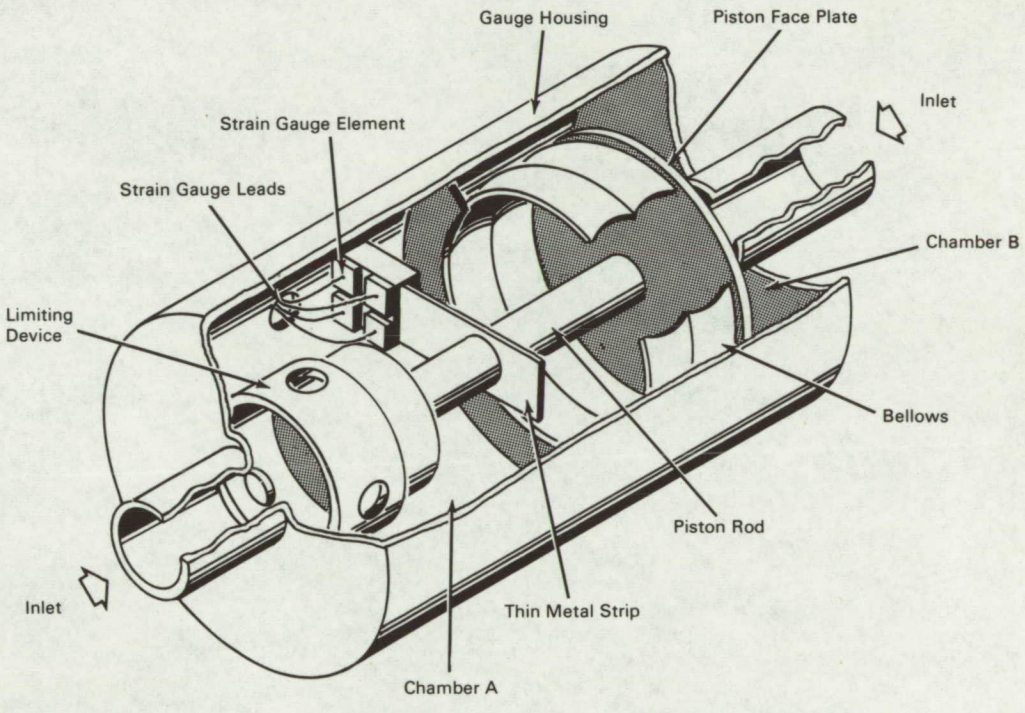
NASA TECH BRIEF

Differential Pressure Gauge Has Fast Response



The problem: To design a differential pressure gauge that will reliably measure rapidly changing pressures as low as 10^{-3} mm Hg. A thermocouple gauge will measure these small pressures but has the slow half-time of about 5 seconds. An ionization gauge has the range and rapid response desired but causes decomposition of organic fluids and the gauge quickly becomes contaminated and unreliable.

The solution: A differential pressure gauge using semiconductor-type strain gauge elements. Output of the strain gauge elements is a dc voltage that is directly proportional to the pressure difference being measured.

How it's done: The differential pressure gauge has two chambers (A and B) separated by a bellows and piston. The bellows is attached between the piston face plate and gauge housing in one chamber and the piston rod connects with a limiting or damping device in the other chamber. Between the two, a flat, thin strip of flexible metal is mounted on one end to the gauge housing and on the other end to the piston rod. Cemented on this metal strip are four semiconductor-type strain gauge elements wired together in a Wheatstone bridge arrangement. A pressure difference between chamber A and chamber B is transmitted to the strain gauge elements by the action of the bellows

(continued overleaf)

and piston flexing the thin metal strip. This flexing causes a change in the resistance of the elements that alters an applied dc voltage directly proportional to the difference in the pressures of the two chambers. The limiting device on one end of the piston rod damps the motion of the piston and belows under high pressure differences between the chambers.

Notes:

1. This gauge has rapid response and may be made of materials that are inert to most fluids.
2. Accuracy and sensitivity of the gauge is governed by the semiconductor strain elements used.
3. Inquiries concerning this innovation may be directed to:

   Technology Utilization Officer
   Marshall Space Flight Center
   Huntsville, Alabama, 35812
   Reference: B65-10285

Patent status: NASA encourages commercial use of this innovation. No patent action is contemplated by NASA.

Source: Harold S. Weber of Armour Research Foundation under contract to Marshall Space Flight Center (M-FS-358)