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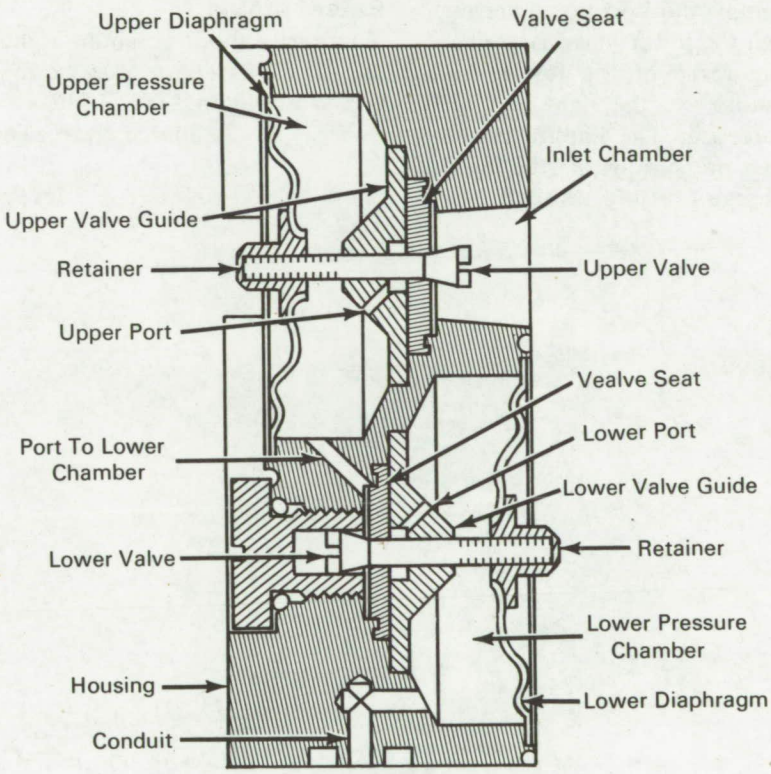
NASA TECH BRIEF

High Impact Pressure Regulator Withstands Impacts of Over 15,000 g



The problem:

To develop a high impact pressure regulator capable of withstanding impacts of over 15,000 g. The regulator, to be used with a high impact gas scannograph, must be capable of regulating pressures from 2000 to 200 psig so as to maintain output pressures in a range of 82 to −1.2 psig. The instrument must be able to withstand high impact and continue to function accurately for long periods of time. In the past, spring loaded pistons and other structures having large mass were used. These regulators were not able to withstand high impact forces and could not function continuously and accurately.

The solution:

A carefully constructed regulator, welded by helium arc and other special processes, that has two chambers which are similar in structure but which respond to different pressure valves. One chamber and associated valving structure maintains a first pressure while the second chamber with associated valving structure

(continued overleaf)

maintains a different and reduced pressure. By the passage of fluid through the first and second chambers, the pressure of the third is regulated from a specific input valve to the desired output pressure valve.

How it's done:

The upper valve is biased to an open position by the upper diaphragm. If fluid pressure entering the upper chamber through the upper port is greater than the opposing spring force exerted by the upper diaphragm, the diaphragm moves to the left and the valve moves toward the valve seat. The diaphragm and valve are adjusted to hold a pressure of between 100 and 150 psig in the upper chamber.

Fluid pressure from the upper chamber passes through the lower valve into the lower pressure chamber. The lower valve is biased to an open position by the lower diaphragm. If fluid pressure entering the lower chamber through the lower valve is greater than the opposing spring force of the lower diaphragm, the diaphragm moves to the right and the valve moves toward the valve seat. The diaphragm and valve are adjusted to hold a pressure within the lower chamber so that the discharge pressure through the conduit will be 80 psig.

Notes:

1. This pressure regulator was designed to handle small volumes of gas flow for a gas scannograph. The flow rate is on the order of 50 ml per minute.
2. The regulator successfully withstood an impact force on the order of 15,000 g for about 2 msec and continued to function properly.
3. This regulator could be used on equipment and machinery subject to high vibratory and impact problems.
4. Inquiries concerning this invention may be directed to:

   Technology Utilization Officer
   NASA Pasadena Office
   4800 Oak Grove Drive
   Pasadena, California 91103
   Reference: B67-10274

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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