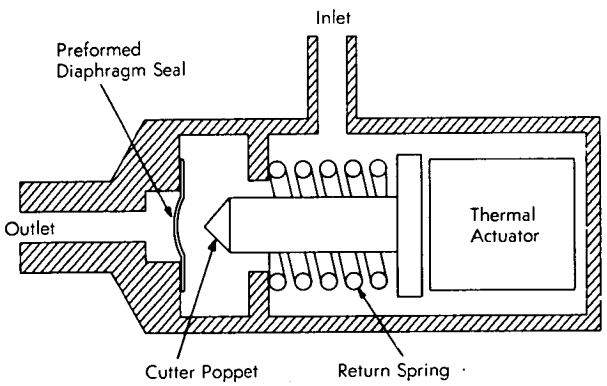
NASA TECH BRIEF
Ames Research Center

Hermetic Isolation Valves

The hermetic isolation and sealing of systems is highly desirable for spacecraft that must coast for years before their engines and attitude control systems are put into use. Planetary landers, which carry high pressure gases for experiments also have similar requirements.



The hermetic isolation valve shown schematically in the diagram can only be operated once. The diaphragm is preformed to minimize deflections with upstream pressure variations and is welded in place. When flow is desired, the heater is activated; the heat-sensitive material expands, pushing the cutter poppet through the diaphragm and cutting a pattern which allows flow to commence without pieces of the diaphragm being torn loose. The inlet pressure assists in spreading the cut pattern as the diaphragm opens. After the diaphragm is pierced, the heater is deenergized; as the housing and heat-sensitive actuator material cools, the diaphragm cutter poppet is retracted by the return spring.

An electromagnetic version of the valve is similar to the thermally-actuated unit. When the coil is energized, it delivers a magnetic force impulse to the plunger, driving it through the diaphragm; only a short pulse of electrical energy is required, and a spring then retracts the plunger.

The thermal unit is more suitable for systems where low power consumption over a long period is preferable to the short, high-power impulses needed to actuate an electromagnet. The thermal unit can be used when fast response is not required; since it can be initiated by excess environmental temperatures, it may find use in fire-protection systems.

This design concept may be utilized in aircraft gas systems that are commanded into use after being stored for long periods of time, e.g., fire extinguishers or emergency actuators.

Note:

No additional documentation is available. Specific questions, however, may be directed to:

Technology Utilization Officer
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Reference: B72-10013

Patent status:

No patent action is contemplated by NASA.

Source: M. J. Makowski and
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Category 06