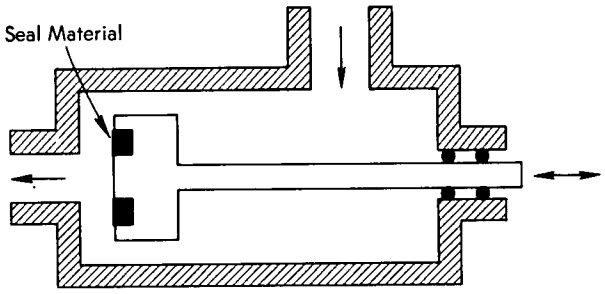
NASA TECH BRIEF

Ames Research Center

Zero-Leakage Valves

The problem:

To design a propellant valve which does not leak after numerous operations. Metal-to-metal seats require enormous pressures for closure and can be operated only a limited number of times; elastomers exhibit cold flow.



The solution:

Let the valve action confine a polymeric material in a metal groove so that the seal is effected purely by the compressive reaction of the polymer, much as is done in demountable vacuum systems.

How it's done:

The ring of polymeric seal material in the poppet indicated in the diagram is compressed when the valve is closed. Since the polymer ring is completely enclosed by metal when the poppet closes off flow of propellant, the polymer is trapped under a predetermined compression, and it will remain in this state until the poppet load is removed. The salient feature of this design is that the compressive reaction of the polymeric material is used to effect the seal, and since cold flow cannot take place, the resiliency of the sealing material is preserved over many operations.

A variety of polymeric materials may be used in this type of valve but since the valve was to be used with highly reactive propellants, poly(tetrafluoroethylene) polymers were mandatory; however, any type of synthetic rubber or elastomer can be used for ordinary liquids and gases.

Note:

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

Technology Utilization Officer
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Reference: B72-10024

Patent status:

No patent action is contemplated by NASA.

Source: R. J. Salvinski of
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Category 06