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Brief 69-10545

NASA TECH BRIEF

Integral Valve Provides Automatic Relief and Remote Venting

The problem:

To design a dual mode integral valve package that provides both automatic relief of a tank at a precise over-pressure and remote control of tank venting. The valve must provide fast relief response within a temperature range of −270° to +260°F at high pressure rise rates (up to 40 psi/sec).

The solution:

An in-line, pilot-operated, differential area, poppet type valve in which relief and vent operations are separate functions incorporated in an integral valve package. Differential pressure conditions initiate automatic tank relief, and application of a control pressure provides rapid remote control of the tank venting operation.

How it's done:

In the relief operation, as the tank pressure monitored at the sensing port exceeds the pre-set calibration pressure of the bias bellows, the pilot plunger strokes the ball off its seat. This action relieves pressure in the poppet cavity to the atmosphere. The poppet cavity bleeds down rapidly as the ball closes off supply pressure. The unbalanced force caused by a differential pressure between the flow cavity and poppet cavity moves the flow poppet to an open position, thus providing tank relief. A reverse process closes the flow poppet as sensing pressure is decreased by the relief operation.

In the vent operation, the flow poppet is opened by the remote application of pressure to the open control piston. The flow poppet is closed by mechanical spring force of the welded bellows when control pressure is removed.

Notes:

1. A "force close" (gas piston) feature is provided, if faster or redundant valve closing is desired for the vent operation. Full closed and full open flow poppet position indicator switches permit remote monitoring of the valve operation. Vent response times are as follows:
   a) Full open time of 0.4 sec maximum at 44 psig, system pressure, ±200°F.
   b) Closing time of 0.5 second nominal, 1.0 sec at −270°F.

   Internal leakage rates (across all dynamic seals) are less than 50 scim of helium at −300°F to +260°F. External leakage rates are zero at 45 psig with helium.
2. Inquiries concerning this innovation may be directed to: Technology Utilization Officer
   Marshall Space Flight Center
   Huntsville, Alabama 35812
   Reference: B69-10545

Patent status:

Inquiries about obtaining rights for the commercial use of this invention may be made to NASA, Code GP, Washington, D.C. 20546.

Source: R. F. Gilmore of
Chrysler Corporation
under contract to
Marshall Space Flight Center
(MFS-12134)

Category 05