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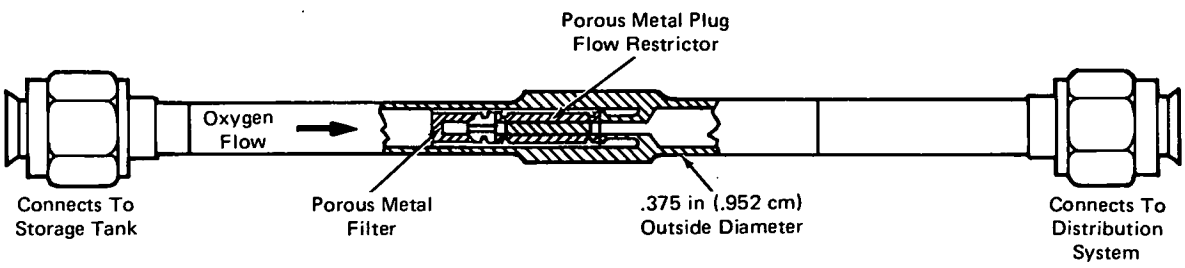
NASA TECH BRIEF

Marshall Space Flight Center

Controlled Flow Assembly



The problem:

Shock-ignition may occur in high-pressure oxygen supply systems upon opening the valves that isolate the storage system from the distribution system.

The solution:

When the isolation valves are closed, a porous metal plug maintains oxygen pressure on the "downstream" side of the system. This "balancing" pressure eliminates the danger of fire or explosion caused by shock-ignition.

How it's done:

Oxygen is allowed to bleed from the storage tank into the distribution system at a controlled rate. A porous metal plug is used because the most common type of gas bleed, a small hole, will easily clog and will not provide controlled flow over the temperature and pressure range needed.

The porous plug is made by heating a stainless steel powder at a temperature lower than its melting point, but high enough to fuse the powder into a solid mass. This sintered metal plug is made in a special stainless steel housing and is used in conjunction with a sintered filter placed upstream from the plug to keep contaminants from clogging the plug (see figure).

The following data were obtained from tests on the plug:

Pressure Ratings	psig	$N/m^2 \times 10^6$
Normal operating range	800 to 3,000	5.5 to 21
Design operating pressure	4,500	31
Proof pressure	9,000	62
Burst pressure	18,000	124

Flow Rates (with ambient downstream pressure)

Upstream Pressure		Temperature Range		Flow Rate		
psig	$N/m^2 \times 10^6$	°F	°C	lb/hr	mg/s	
960	6.7	70 ± 10	21 ± 5.5	0.0050	0.63	min.
960	6.7	0 to 120	−18 to 49	0.0040	0.53	min.
2,350	16.3	70 ± 10	21 ± 5.5	0.0506	6.38	max.
2,350	16.3	0 to 120	−18 to 49	0.0583	7.35	max.

Some significant specifications are:

Maximum external leakage	1×10^{-7} std cm^3/s of He at 31×10^6 N/m^2 and −18 to 49°C.
Expected operating life	5 years (2 years hard vacuum)
Test life	2,304 hours
Expected storage life	5 years
Operating media	O_2 (gas)
Maximum weight	0.114 kg (0.25 lbs)
Cleaning	Ultrasonically with Freon and nitrogen purge-dried

(continued overleaf)

Notes:

1. This innovation may be of interest to the biomedical, chemical, pollution control, and mining industries.
2. There is no additional information concerning this innovation, however, specific questions may be directed to:

   Technology Utilization Officer
   Marshall Space Flight Center
   Code A&TS-TU
   Huntsville, Alabama 35812
   Reference: B72-10404

Patent status:

Inquiries about obtaining rights for the commercial use of this invention may be made to:

Patent Counsel
Marshall Space Flight Center
Code A&TS-PAT
Huntsville, Alabama 35812

Source: A. E. Cohen of
McDonnell-Douglas Corp.
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