NASA TECH BRIEF

Ames Research Center

Cavitating Venturi Sump

The problem:

To vent harmlessly the hazardous working fluid of fluidic systems that are on board spacecraft or rockets.

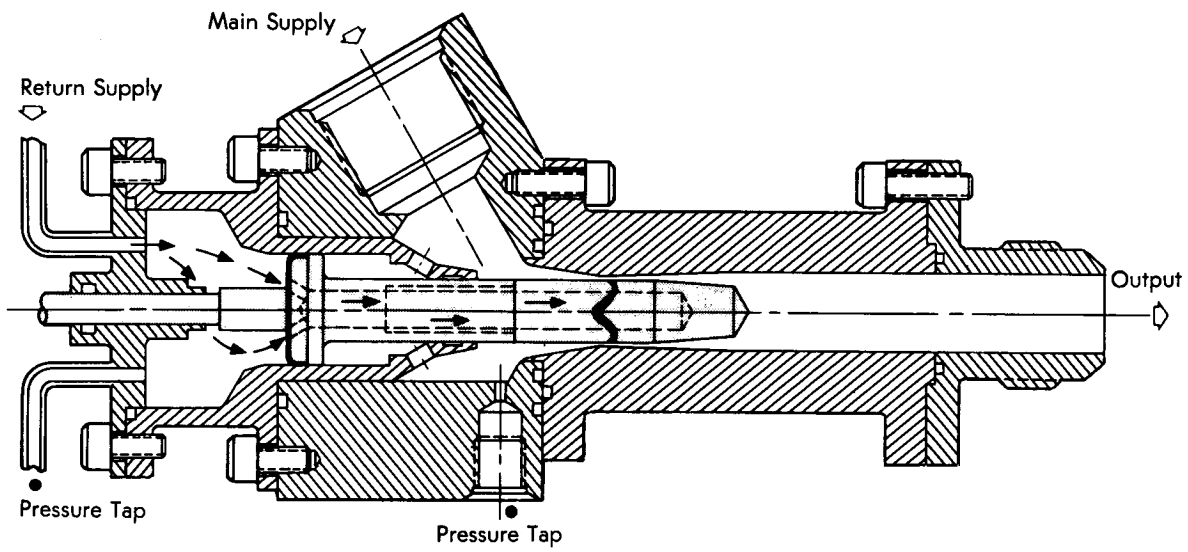
The solution:

Duct the spent fluid into a cavitating venturi sump that is formed in a main stream of propellant.

How it's done:

The operation of fluidic control systems requires a continuous supply of working fluid; after passing through the system, the spent fluid is vented to a constant pressure sump, and this is generally accomplished by overboard venting to the environment. In many instances, the venting of working fluid, particularly propellants, is wasteful of onboard power and often impractical because propellant leakage could lead to fire and explosions; also, vented propellants often constitute toxicity hazards to personnel.

The cavitating venturi sump is a practical solution to the venting requirement, in that working fluid may be bypassed from the mainstream to operate a fluidic system and then returned to the sump. Because of the existence of cavitation, the venturi sump also provides a constant pressure reference which is useful in fluidic regulation systems and timing circuits.



A test configuration of the venturi sump is shown in the diagram; the main supply flows around a fixed pintle through a minimum-area section (annular ring) and downstream to the output. Cavitation occurs just downstream of the minimum area section, and a pocket or cavitation bubble is formed which

(continued overleaf)

is at the vapor pressure of the main supply fluid. The spent working fluid of the fluidic system is allowed to flow through the center of the pintle into the cavitation bubble in the region of constant pressure via equally spaced orifices around the periphery of the pintle. The optimum return point is just downstream of the throat section. One possible improvement is the return of working fluid through an annular slit in the pintle or valve body rather than through centrally located orifices.

Notes:

1. The following documentation may be obtained from:

   National Technical Information Service
   Springfield, Virginia 22151
   Single document price $3.00
   (or microfiche $0.95)

   Reference: NASA CR-86435 (N70-39401), Advanced Spacecraft Technology, Final Report.
2. No additional documentation is available. Specific questions, however, may be directed to:

   Technology Utilization Officer
   Ames Research Center
   Moffett Field, California 94035
   Reference: B72-10012

Patent status:

No patent action is contemplated by NASA.

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