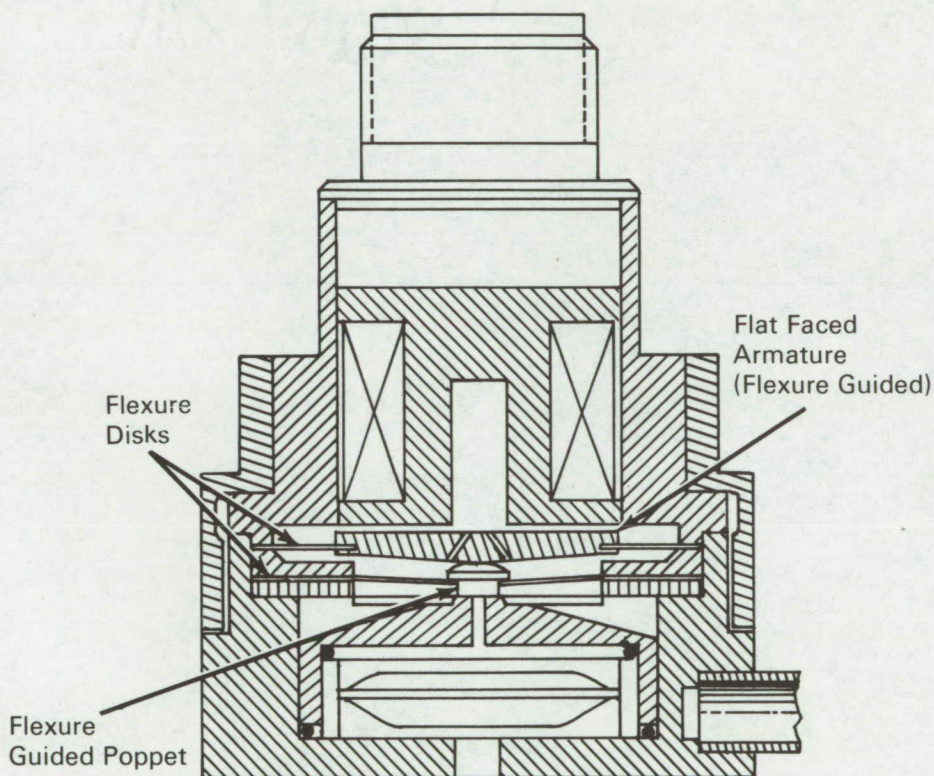


NASA TECH BRIEF



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Solenoid Valve Design Minimizes Vibration and Sliding Wear Problem



The problem:

To design a two-way cryogenic solenoid valve that will resist damage from vibration and metallic interfacial sliding. Previous plunger-type designs encountered difficulties due to the close tolerance sliding members and were easily fouled by galling and/or foreign particle contamination, especially where low axial forces were present and lubricants were restricted to the dry-film types.

The solution:

The new system features a flat-faced armature guided by a flexure disk. This eliminates sliding surfaces and is expected to enhance reliability by being less subject to contamination and wear.

How it's done:

The design incorporates a metal poppet and seat arrangement, with the poppet guided by a flexible metallic disk to minimize relative motion between the

(continued overleaf)

poppet and seat during vibration. This reduces wear and subsequent leakage. The armature is a flat-face type supported by a second flexible metallic disk. The flat metal-to-metal seat arrangement also provides efficient control of pressure unbalance, this being of prime importance in minimizing solenoid forces, and provides accurate control of poppet stroke and the resultant armature-to-solenoid air gap. The only sliding surfaces in the system are the coil spring and its mating bore; the interfacial wear caused by this sliding should not be troublesome as clearances are relatively large and the total surface area in contact is small, providing less chance for collected contamination.

Note:

This development is in conceptual stage only, and, as of date of publication of this Tech Brief, neither a model nor prototype has been constructed.

Patent status:

No patent action is contemplated by NASA.

Source: W. A. Gillon, Jr.
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