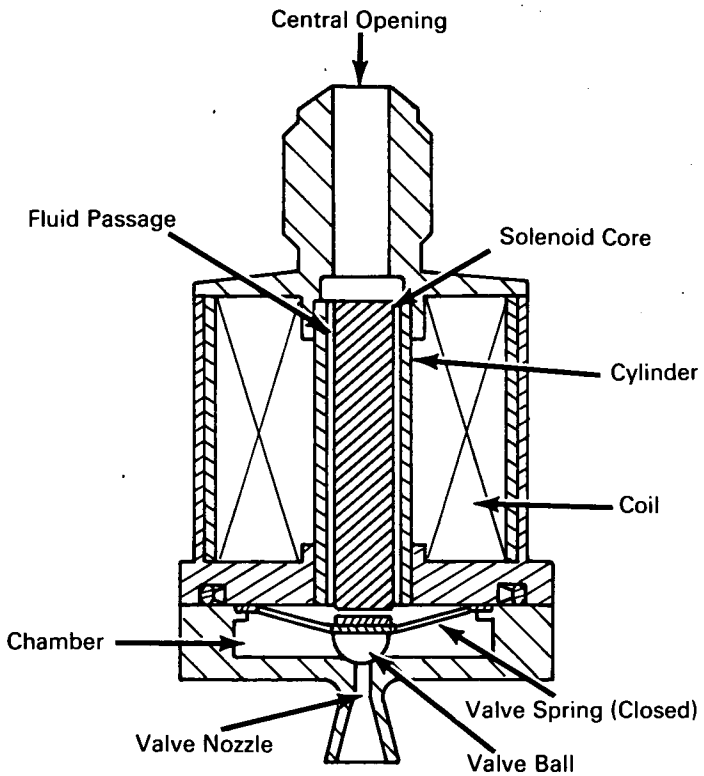
July 1967

Brief 67-10219

NASA TECH BRIEF

Solenoid Valve Design Has One Moving Part



The problem:

To design a simple solenoid valve with a minimum number of moving parts. A need exists for a valve which has the capability of being recycled many hundreds of thousands of times without experiencing malfunction or complete deterioration. Further, valves are needed which do not require lubrication and which are not worn or made inoperative by constant usage and the effect of friction caused by sliding and moving parts.

The solution:

A valve structure that has only one moving part, a ball and spring assembly. There is no sliding motion contact between stationary and moving parts or between moving parts within this valve.

(continued overleaf)

How it's done:

A centrally positioned solenoid core is surrounded by a fluid passage through which fluid may flow from the inlet to the discharge side of the valve. A cylinder made of magnetically permeable material surrounds the core and forms the outer wall of the fluid flow passage. The solenoid core is controlled by the coil and current to the coil may be controlled by conventionally known means particularly adaptable to the specific installation requirements for this valve.

The valve ball which seats on the valve nozzle is retained by the valve spring. The valve spring has many holes through which the fluid may flow into the chamber before it is released by the ball for flow through the nozzle.

The solenoid core attracts the metallic upper part of the ball to move the ball off the valve seat of the nozzle. The spring provides a downward force which resists the upward pull of the solenoid core. Thus the position of the ball relative to the valve nozzle is determined by the force differential between the forces exerted by the solenoid core and the spring. By properly controlling the flow of electrical current to the coil by appropriate electrical current control means, a proper setting may be constantly maintained for the ball in relation to the nozzle, thereby controlling the flow of the fluid for any desired flow rate through the solenoid valve.

Notes:

1. This valve is theoretically capable of producing 0.010-inch movement in 10-milliseconds.
2. The reliability provided by this design is required in situations where the valve structure is not accessible for maintenance, repair or replacement for long periods of time during which the valve must operate continuously and effectively.
3. This development is in a conceptual stage only, and as of date of publication of this Tech Brief, neither a model nor prototype has been constructed.
4. Inquiries concerning this invention may be directed to:

   Technology Utilization Officer
   NASA Pasadena Office
   4800 Oak Grove Drive
   Pasadena, California
   Reference: B67-10219

Patent status:

No patent action is contemplated by NASA.

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