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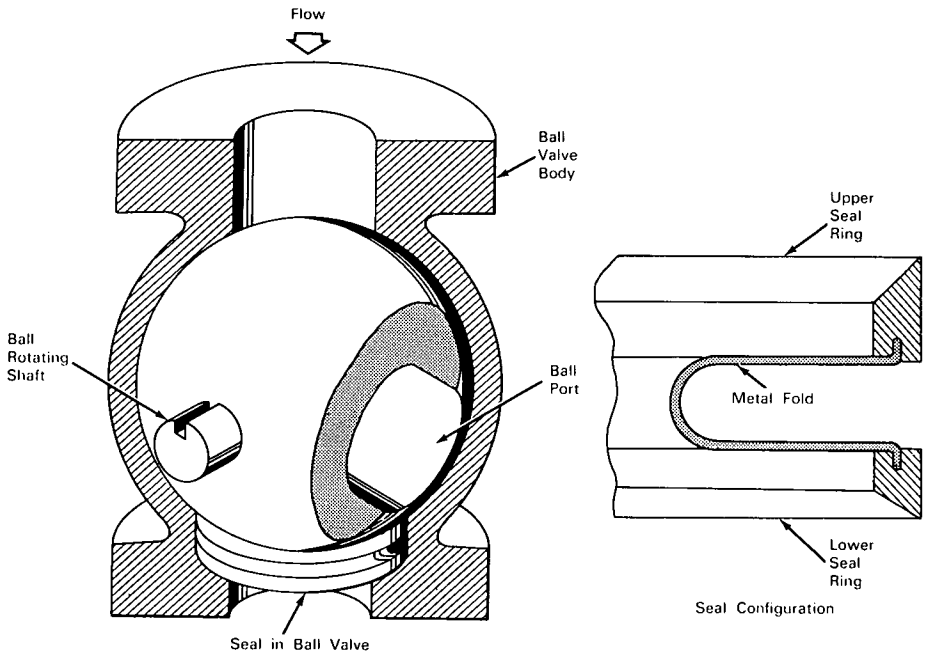
NASA TECH BRIEF

Pressure Responsive Seal Handles Static and Dynamic Loads



The problem: The sealing of ported ball valves under both static and dynamic load conditions. Conventional seals have used fluid pressure to achieve more effective sealing but have been useful for sealing under static conditions only. Single seals for operation under both static and dynamic conditions have used a sliding seal between the valve housing outlet and ported ball. This consists of an O ring adapted to seal between the valve housing and a support member, a sealing ring attached to an extremity of the support member, and a spring to load the sealing ring against the ported ball. Under loading, this seal suffers an effective pressure limit related to the spring tensile strength.

The solution: A line-pressure responsive double-acting seal in which the top of the seal engages the ported ball at the outer circumferential edge of the seal upper end and the bottom of the seal seats on a flat circular land with a continuous wall, similar to a counterbore.

How it's done: The seal consists of plastic upper and lower rings bonded to the opposing lips of an inwardly projecting fold of metal. This fold of metal serves two purposes: it forms an annular passage for free flow of fluid when the ball valve is in the port open position; and it acts as a spring to keep the seal surfaces in intimate contact with the ball and body

(continued overleaf)

land in the port closed position. In the port closed position, as pressure increases, the ball compresses the seal against the land and the soft plastic faces of the seal fill any irregularities in either ball or land. As pressure drops, in the port closed position, the fold of metal acts as a spring and maintains the plastic rings in intimate contact with ball and land. In the port open position, the fold of metal acts continuously as a spring to maintain the plastic rings in intimate contact with ball and land. In this position, the tension exerted by the fold of metal on the plastic rings is directly proportional to the pressure of the fluid acting upon it. As the fluid pressure increases, the metal fold is forced outward and exerts bidirectional force upward and downward against the ball-engaging and land-engaging plastic rings, respectively.

Movement of the ported ball is by means of a keyed shaft through its center operated manually or by suitable mechanical arrangement.

Note: This seal would be useful wherever fluids under varying pressures are to be transferred in random quantities.

Patent status: Title to this invention has been waived under the provisions of the National Aeronautics and Space Act (42 U.S.C. 2457 (f)), to the North American Aviation, Inc., 1700 East Imperial Highway, El Segundo, California, 90246.

Source: H. W. Marsh of North American Aviation, Inc. under contract to Goddard Space Flight Center (GSFC-441)