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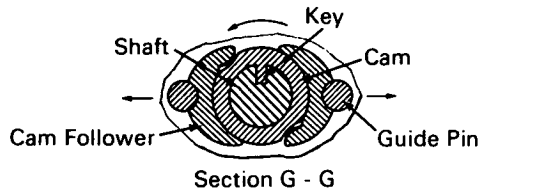
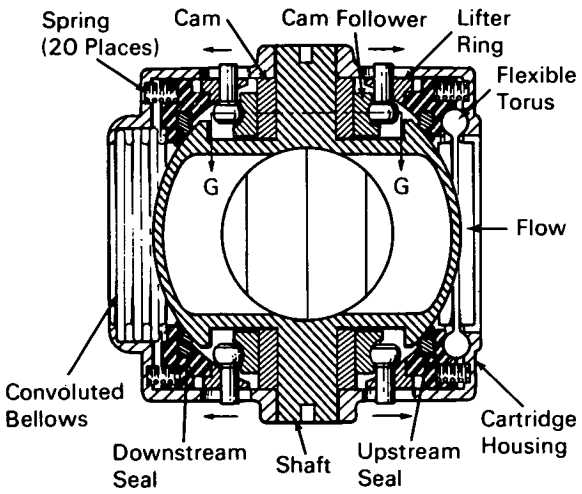
NASA TECH BRIEF

Long Life, Low Cost Ball Valve, with Lifted Seals and Cartridge Type Construction

A new ball valve design incorporates a modular construction in an easy-to-install, easy-to-replace cartridge housing, and a system of cams to lift the upstream and downstream seals away from the ball during ball rotation. The concept provides longer valve life and improved seal performance through less wear on the seals, and less expensive maintenance through easier replacement of the entire assembly. In tests conducted on N_2O_4, the new valve proved to be more than 200 times more efficient than previous models in preventing leakage.



Section G - G



Longitudinal Section of Cartridge

The ball section of the assembly is integral with an axial shaft and has a central hole which is normal to the shaft. When this hole is in alignment with the two opposing holes in the cartridge housing (see fig.), the valve is open. Inside and around the downstream opening in the housing is a short, convoluted, metallic bellows for absorbing outward movement of the downstream seal. A flexible torus serves the same purpose at the upstream end: to seal between the upstream seal and the housing while permitting outward movement of the seal.

Between the open and closed positions of the valve, the ball rotates 90 degrees. At the beginning of the "open" rotation, the ball seals are lifted away from the ball by cams on the ball shaft. The cams operate through a system of cam followers, guide pins, and lifting rings surrounding the ball. During the closure rotation, these seals are not moved; i.e., ball-to-seal contact is maintained. When the valve is closed, the ball seals are pressed against the ball by springs and by operational pressure exerted on their exposed areas.

An Oldham-type coupling connects the ball shaft to the valve operating mechanism. This coupling engages keyways in the ball shaft and the operating shaft, permitting considerable nonalignment between the two. Thus the cartridge can be easily installed in the valve body without disturbing the assembly or adjusting the operating mechanism.

For high-pressure systems, the torus-bellows system described is recommended. For low-pressure applications, however, the torus and bellows can be omitted, and the ball seals can be replaced with one-piece flexible lip seals. This design costs less to fabricate and is easier to clean.

(continued overleaf)

Note:

Requests for further information may be directed to:

Technology Utilization Officer
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Houston, Texas 77058
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No patent action is contemplated by NASA.

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