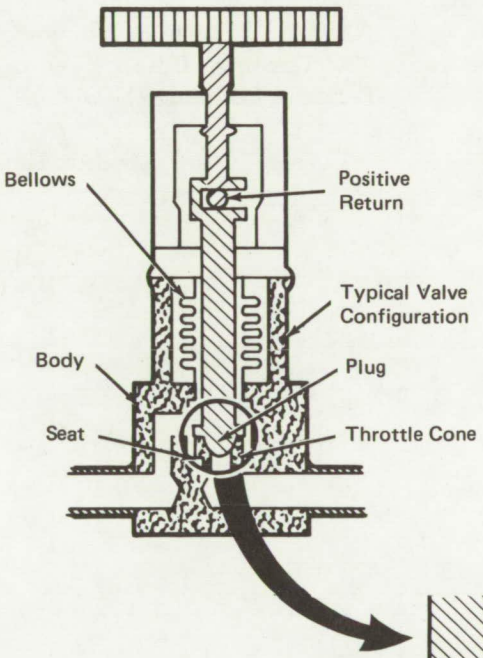
# NASA TECH BRIEF

*NASA Pasadena Office*



## Shutoff and Throttling Valve

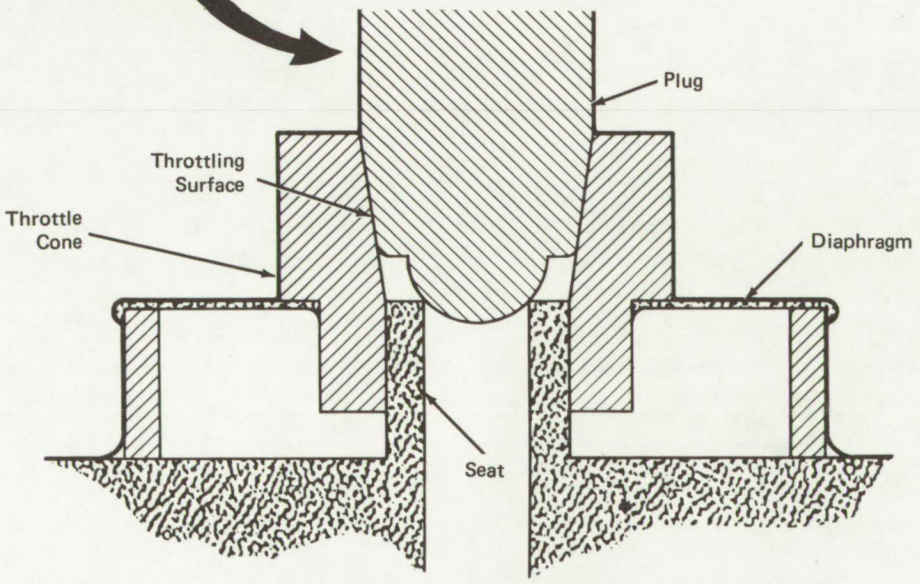



### The problem:

Only a few designs of the multitude of different valve models marketed today are capable of reliable operation under extreme hot and cold temperatures. None of these designs provides a combination of features, such as leaktight shutoff, precise flow control, and a very low pressure drop in a wide-open state.

### The solution:

Leaktight shutoff, precise flow control, and a very low pressure drop are incorporated in an all-metal valve designed for operation under extreme temperatures. The valve constructed with refractory metal is intended for the control of high-temperature liquid cesium. It has many other applications related to the control of high- and low-temperature liquids and gases.




Typical Arrangement of Throttle Cone Valve

(continued overleaf)

## How it's done:

The schematic shows this valve with a spherical plug seat which closes on a circular edge; however, any proven plug-seat geometry can be used. Throttling is accomplished by constraining the fluid to flow through the throttle cone and a mating conical surface on the plug body. Since the throttling surface is oriented at a very small angle to the plug axis, a given displacement of the plug produces a very much smaller displacement of the gap opening. When the plug has traveled the desired distance for the throttling state, it clears the throttle cone, producing a much larger increase in flow area for a given plug displacement.

The valve has the throttle cone attached to a diaphragm. The purpose of this diaphragm is to allow the throttle cone to displace toward the seat under the action of the plug. This permits the plug to seal on the seat even if it is misaligned and touches the throttling surface before resting on the seat. Other flexible member designs, such as a bellows could also be used.

When leak tested with helium in its shutoff position, the valve is practically leaktight, passing less than $1.2 \times 10^{-10}$ standard $cm^3/s$ of helium. Flow tests with nitrogen indicate that the controllable range of the valve is over 100:1.

## Notes:

1. This valve may be of interest to valve manufacturers and nuclear reactor manufacturers.
2. Requests for further information may be directed to:
   Technology Utilization Officer
   NASA Pasadena Office
   4800 Oak Grove Drive
   Pasadena, California 91103
   Reference: TSP74-10105

## Patent status:

This invention has been patented by NASA (U.S. Patent No. 3,802,660). Inquiries concerning nonexclusive or exclusive license for its commercial development should be addressed to:

Patent Counsel
NASA Pasadena Office
4800 Oak Grove Drive
Pasadena, California 91103

Source: Lance G. Hays of
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