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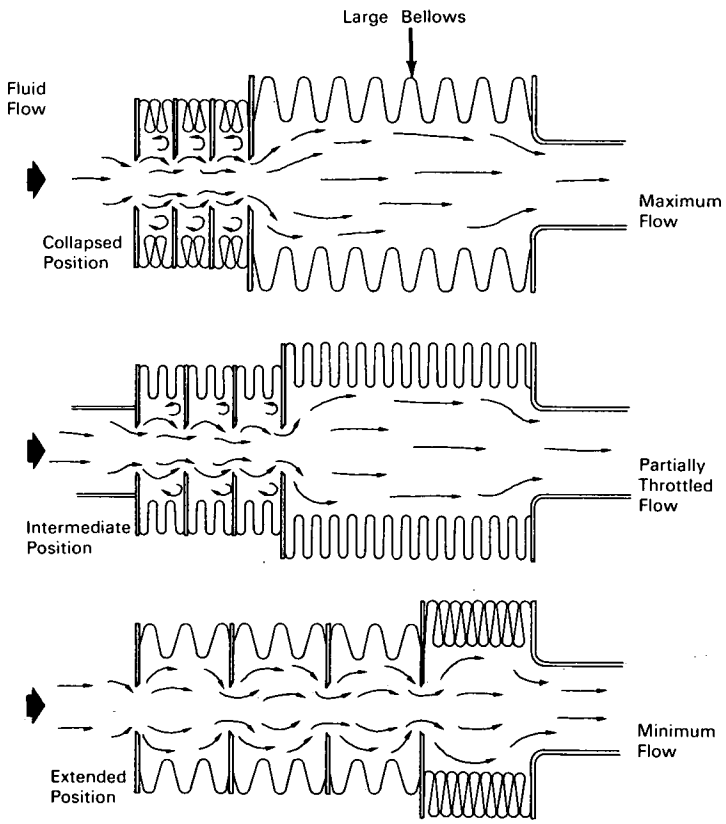
NASA TECH BRIEF

Multiple-Orifice Throttle Valve



There has been a need for a throttle valve that is not subject to cold welding in a vacuum environment and is compatible with strong oxidizing fluids (such as in high-energy rocket propellants). Most valve designs incorporate seals of organic materials, which deteriorate in the presence of strong oxidizers, and sliding or rotating parts, which may bind as a result of cold welding in vacuum.

The valve design shown in the schematic is of all-metal construction using simple components that do not slide or rotate and excludes static or dynamic seals. It consists of a series of orifices separated by short bellows. When the orifices are close together (in the collapsed position) they act as a short pipe orifice or a short corrugated pipe and provide limited restriction to fluid flow. Thus for a given pressure differential, this configuration would provide a maximum flow rate. As the assembly is extended, the distance between the orifices increases, so that each orifice separately exerts a greater throttling effect on the

(continued overleaf)

flow. At maximum extension of the orifice bellows, the flow rate of the fluid is at a minimum.

A large bellows is secured to a large-diameter opening at the outlet end and to the last orifice plate at the other end. Accordingly, when the series of orifices are moved apart, the increase in distance between the first and last of the orifices is taken up by the decrease in distance between the last orifice and the large-diameter opening at the outlet end of the valve. The decrease in length of the large bellows does not substantially affect fluid flow, and therefore does not substantially offset the greater throttling due to increased separation of the orifices. The mechanism for changing the separation of the orifices may be positioned externally, and, therefore, need not come in contact with the fluid. In some applications it may be desirable to use a series of two or more throttling orifices of different diameters, mechanisms that move the orifices so as to provide different separations between them, or different types of orifices such as rounded or Borda types.

Note:

No further documentation is available. Inquiries concerning this innovation may be directed to:

Technology Utilization Officer
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Patent status:

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