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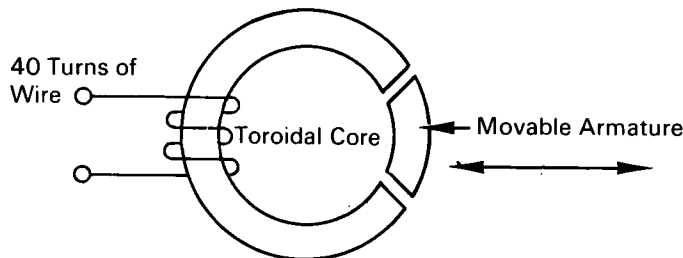
Brief 67-10623

NASA TECH BRIEF



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Ferromagnetic Core Valve Gives Rapid Action on Minimum Energy



The problem:

To obtain a fast-acting valve for controlling propellant flow during tests on a coaxial plasma accelerator. It was found during studies that only 60% of the propellant was available for the accelerating process. This efficiency loss was attributed to a sluggish valve controlling the propellant injection into the thruster.

The solution:

A miniature solenoid valve, utilizing advanced ferromagnetic core design which meets all the rapid-acting requirements with a minimum of input energy. With concise packaging, the entire valve, including its energy-storage capacitor and switching electronics, fits into one cubic inch. The mechanical operation is simple, eliminating part wear and maintenance.

How it's done:

The valve consists of a toroidal core wound with 40 turns of wire. A 60° sector of the core is cut out and mounted on a Be-Cu diaphragm to serve as a movable armature. This diaphragm also provides the restoring force toward the null position. A 5-mm diameter hemispherical plug, mounted on the armature, seats against an O-ring to form the valve closure. The valve is fed from a 125-microfarad electrolytic capacitor, charged to voltages between 20 v

and 150 v, and is switched with a silicon-controlled rectifier.

Notes:

1. This valve has been successfully tested through 28 million cycles at a frequency of 100 cycles/sec without seal deterioration. The valve operates on 0.1 joule of energy and opens or closes in about 100 microseconds.
2. This valve can be used in any flow control application requiring a high degree of reliability, small size, and fast response.
3. Inquiries concerning this innovation may be directed to:

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(continued overleaf)

Patent status:

No patent action is contemplated by NASA.

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