NASA TECH BRIEF

Ames Research Center

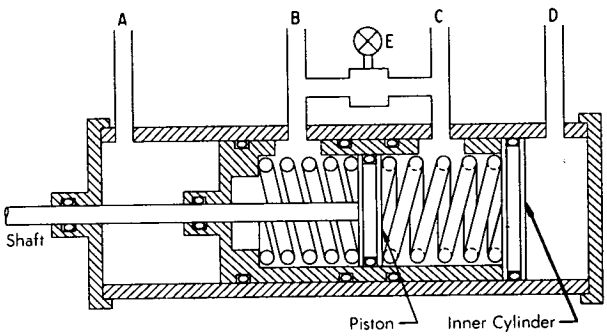
Gyro Spring Augmentation System

The problem:

To vary the stiffness of hydraulic control systems.

The solution:

A spring-loaded piston with provision for hydraulic control of spring action.



How it's done:

The hydraulic cylinder shown schematically in the diagram is operated in the usual fashion by applying hydraulic fluid pressure at ports A or D, whereby the entire inner cylinder acts as a piston to move the shaft. When ports B and C are open and valve E is either closed or open, the piston is free to move inside the inner cylinder; in this configuration, the shock of sudden movements of the shaft due to external forces is absorbed by the opposing springs and the system is seen to be at minimum stiffness. On the other hand, if ports B and C are closed and valve E is closed, the piston in the inner cylinder is in hydraulic lock, and the system is at maximum stiffness. Intermediate stiffnesses and damping rates can be obtained by using valve E to control the rate of interchange of hydraulic fluid between the two compartments in the inner cylinder when ports B and C are closed. Alternatively, valve E remains closed (or is omitted) and the rates of flow in or out of ports B and C may be established automatically by an external system.

Hydraulic cylinders of this type with appropriate servo-controlled operation of valves at ports A, B, C, and D have been used to control rotary-wing structure models in wind tunnel tests.

Note:

No additional documentation is available. Specific questions, however, may be directed to:

Technology Utilization Officer
Ames Research Center
Moffett Field, California 94035
Reference: B72-10010

Patent status:

No patent action is contemplated by NASA.

Source: H. D. Danielson and
A. W. Brandstetter of
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Category 06