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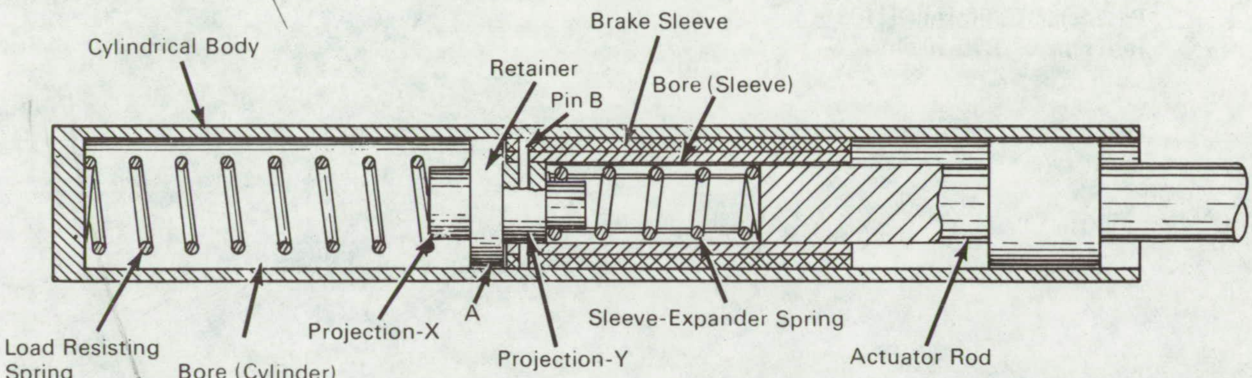
NASA TECH BRIEF

Dry-Frictional Shock Absorber



A kinetic-energy absorber that can safely decelerate a vehicle as it impacts a surface has been developed. This dry-frictional device is designed to afford minimum rebound, is lightweight, compact, and needs no lubrication or hydraulic fluids. It offers a significant advantage over conventional hydraulic shock-absorbing devices and can be used on vehicles operating in high vacuum and extreme temperature environments. Under such conditions, conventional devices eventually lose their lubricants and fluids. This invention might be used in such applications as aircraft landing gear and arresting devices, the bumpers of motor vehicles and railroad cars, and artillery recoil mechanisms. It should interest designers of shock- and energy-absorbing devices requiring minimum rebound.

A cross-sectional view of the device is shown in the figure. It consists essentially of a cylindrical body, housing an internal expanding brake mechanism attached to an actuator rod, which is firmly attached to the vehicle body. The end of the cylindrical body is attached to a landing pad that impacts on a landing surface. The cylindrical body is open at one end and closed at the other end. The bore of the cylinder terminates at the closed end of the cylinder body, and one end of the load-resisting spring butts against this surface. The other end of the spring fits around the projection on the retainer, and butts against portion A of the retainer. Projection-X, of relatively small diameter, serves as a retaining boss for the load-resisting spring. Projection-Y is attached by means of pin B to the brake sleeve. Adjacent to Projection-Y of the retainer is a projection of smaller diameter that serves as a retaining boss for the sleeve-expander spring.

In operation, as the impact forces the actuator rod inward, the end of the rod forces the sleeve-expander spring against Projection-Y of the retainer, which is, in turn, forced against the load-resisting spring. The actuator rod continues to move inward from force of impact, causing the sleeve-expander spring to compress. As the expander spring compresses, it also expands radially, forcing the peripheral surfaces of the spring coils into contact with the bore of the expandable metal sleeve. The metal sleeve then expands radially, forcing the bonded lining of the sleeve into frictional contact with the cylinder bore. Thus, as the impacting load increases actuator rod travel, the braking action is simultaneously increased as a function

(continued overleaf)

of both the increased load-spring compression and the increasing frictional resistance. Maximum braking should occur near the bottom of the stroke.

As the inertia of the impacting mass is absorbed, the sleeve-expander spring will return to normal length, contracting radially, thereby reducing frictional resistance. When the frictional resistance is diminished, the load-resisting spring is allowed to force the braking mechanism and actuator rod back into position for another cycle.

Note:

Requests for further information may be directed to:

Technology Utilization Officer
NASA Pasadena Office
4800 Oak Grove Drive
Pasadena, California 91103
Reference: B70-10040

Patent status:

This invention is owned by NASA, and a patent application has been filed. Royalty-free, nonexclusive licenses for its commercial use will be granted by NASA. Inquiries concerning license rights should be made to NASA, Code GP, Washington, D.C. 20546.

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