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NASA TECH BRIEF



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Modified Hydraulic Braking System Limits Angular Deceleration to Safe Values

The problem :

To modify a conventional spring actuated, hydraulically released, fail-safe disk braking system to control the angular deceleration of a massive antenna within specified safe limits. The conventional systems do not provide properly controlled braking torques to decelerate the antenna at specified rates. Full braking torque is needed to hold in strong winds, but application of the full torque for stopping the antenna may cause excessive g-loading on the antenna structure and associated equipment.

The solution :

A hydraulic system that provides an immediate preset controlled pressure to the spring loaded brake shoes and holds it at this value to decelerate the antenna at the desired rate until it is brought to a stop.

How it's done :

The brakes are released when the pressure from the hydraulic pressure source is ported through a two-way valve to the brake cylinder. The applied pressure counteracts the force of the spring against the brake shoe to release the brake.

When a switch is actuated to apply the brakes, a valve is opened, causing the pressure to drop immediately and hold at a regulated value. This applies limited braking torque to decelerate the antenna at the desired rate (approximately 25° per second per second) until it stops. When an emergency pushbutton is pressed, or the antenna actuates a dead-limit switch,

the pressure drops very fast (exponentially) to below the regulated value to provide a larger deceleration (approximately 50° per second per second). After a short time delay, the pressure drops to zero for full brake torque. The control system is interlocked with a pressure switch to prevent the antenna motor from driving against the brakes. Antenna structural members and mounted equipment are thus protected against excessive shock loading.

Notes :

1. The system includes fail-safe solenoid operated valves to actuate the brake in the event that the main valves fail to operate.
2. This system may have application wherever braking of large moving masses is required.
3. Inquiries concerning this innovation may be directed to:

Technology Utilization Officer
Goddard Space Flight Center
Greenbelt, Maryland 20771
Reference: B66-10310

Patent status :

No patent action is contemplated by NASA.

Source: Phillip M. Green, Robert S. Briggs,
and Malcolm Council
of Collins Radio Company
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Category 05