

Mechanical and Fluid Systems

Spring Joint Package with Overstrain Sensor

Highly efficient flexible joint providing a substantial amount of compliance

Universal joints on NASA's previous space rovers were unactuated and under-constrained, and thus were able to twist into undesirable positions and often lock up. To prevent this problematic seizing, it was necessary to redesign the joint in an encompassing manner that would also protect the integrity of the rover. The newly created joint would provide a capability that is easily integrated into designs and would be applicable for terrestrial benefits.

BENEFITS

- Anti-lock up—provides a restoring force which prevents the joint from twisting itself into a position where it locks up. This restoring force also allows returning to a default position when all external forces have been removed.
- Easily mounted—this joint is many times easier to mount than existing spring joints and can replace a universal or ball joint.
- Highly customizable—magnitude of restoring force and the pivot joint for lateral bend can be adjusted by changing the amount of compression and the length of swage inside the spring. The sensor can also be adjusted (without reconstructing the joint from new material) so that the forces of a specific magnitude trigger the sensor.

technology solution

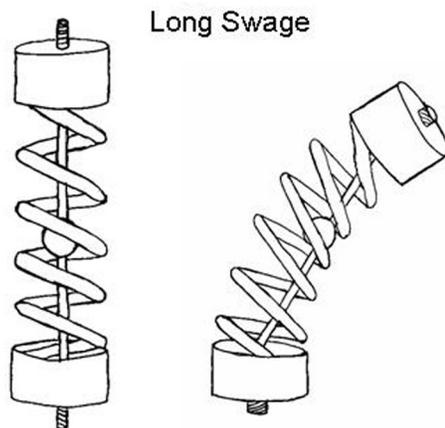


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THE TECHNOLOGY

NASA GSFC's invention is a flexible joint that provides two degrees of freedom and tremendous amount of compliance. The overstrain (OS) sensor joint has a passive and restoring force that allows the joint to return to a default position and is also proportional to the amount of lateral deflection the spring has undergone; this allows the OS sensor joint to be used in many of the under-constrained situations that cause universal joints to lock up. This joint also has a great deal of compliance, enabling it to perform otherwise prohibitive tasks. Finally, there is an integrated, adjustable OS sensor that can be used to prevent damage from excessive applied force.



The sensor detects an excessive force by measuring the lateral bend of the spring which is proportional to the amount of force applied in a given direction.

APPLICATIONS

- The invention can be used as a flexible joint replacement and is beneficial for mechanical arms as well as prosthetic devices.

PUBLICATIONS

U.S. Patent 7,968,812

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