Resetting Semi-Passive Stiffness Damper (RSPSD)

OU ID: #12015

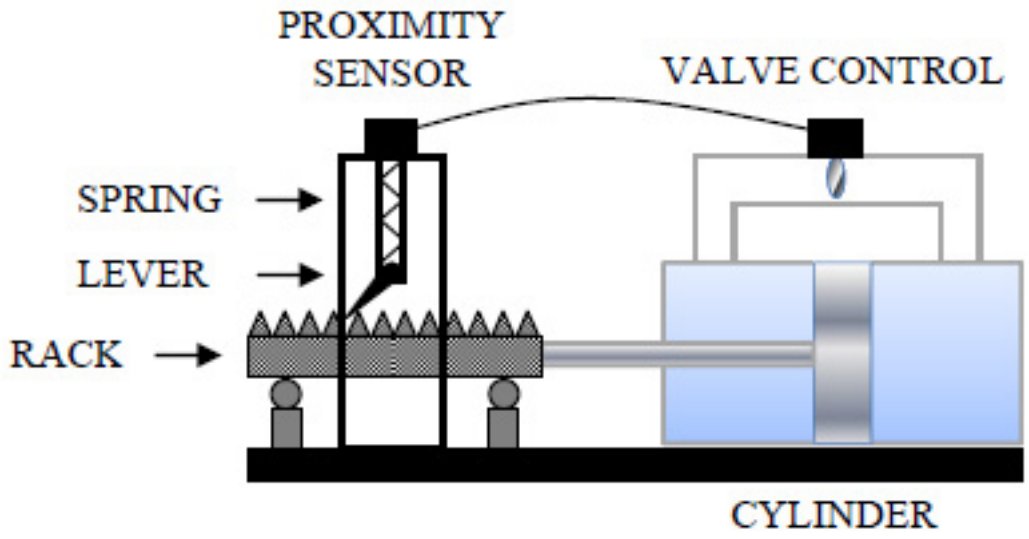
Overview

One way to reduce the devastating fatalities and economic losses of earthquakes is to minimize the vulnerability of civil infrastructure. This can be achieved through infrastructure strengthening and/or implementation of structural control. Structural control can be broadly characterized into three categories: active, passive, and semi-active. Of the three, semi-active control has recently received increased attention due to its adaptability, minimal power requirement, and inherent stability. The Resetting Semi-Active Stiffness Damper (RSASD) has proven effective in reducing the response of structures in the presence of near-field ground motions. The device, however, could be much simpler and produce similar results as demonstrated by the RSPSD.

The RSPSD utilizes a primarily mechanical system that achieves resetting without the need for a complex feedback control system. The mechanical system replaces the encoder and micro-controller components of the RSASD, thereby enhancing the reliability of the damper during a seismic event.

Commercial Application

- Semi-Passive device installed on structure to add/remove stiffness to the structure in times of near-field vibrations/earthquakes
- Also yields potential for use in other fields involving shock absorption including but not limited to automobile suspension, aircraft landing gear, and weapons recoil reduction



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Benefits

- Semi-passive design reaps benefits of both active and passive systems, enhancing reliability while maintaining stability during earthquakes
- Simplicity of system reduces risk of system failure that may occur in sensors, etc. with Semi-active system
- Comparable effectiveness to semi-active system with a simpler design at a lower cost
- Can be implemented on a wide variety of structures as well as on non-structural systems subject to shock-type disturbances

Inventor

Ken Walsh, Ph.D. is a professor of civil engineering here at Ohio University. Dr. Walsh's primary research interests center on structural vibration control, with particular focus in the areas of passive and semi-active control, innovative materials for improved structural performance, and vibration absorption and isolation of mechanical systems. He is the director of the Experimental Engineering Mechanics Laboratory where he also conducts research in experimental structural dynamics. Dr. Walsh has work on multiple research projects related to his research field. He is presently the principal investigator on a project funded by the National Science Foundation to develop technologies for mitigating damage in building and bridge structures subject to dynamic loading. Dr. Walsh has published multiple research articles in academic journals including Computing in Civil Engineering, Structural Engineering, Structural Control and Health Monitoring, Journal of Earthquake Engineering, and Earthquake Engineering and Engineering Vibration. Dr. Walsh first conceived this technology in 2007 and is currently working to develop a functional model.

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