CALIFORNIA STATE SCIENCE FAIR
2017 PROJECT SUMMARY

Name(s)

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Project Number

S0323

Project Title

Innovative Magnetic Shock Absorber Concept for Machines and Vehicles

Abstract

Objectives/Goals

The common shocks absorbers for vehicles use mechanical springs as cushion with air, fluid as damping. My goal is to design a shock absorber using only magnetic force as cushion as well as damping. This will make the design much simpler, cleaner, and smoother in operation compared to the traditional approach. Also, the goal is to investigate if this magnetic shock absorber concept could be used in applications involved in axial, lateral, tangential, or radial motion directions.

Methods/Materials

For the scope of this project, the spring/shock absorbers were simply built using mechanical springs for cushion and air for damping. The passive neodymium magnets were used to build the magnetic shock absorbers. All structure components were built using plexiglas for visual inspection and the ease of fabrications. Testing fixtures were made to test magnet arrangement and performance in different designs either in axial, lateral, longitudinal, or radial motion direction to confirm the possibility of being able to make magnetic shock absorbers for these applications.

Results

The concept design was able to absorb shock load in as little as three cycles or less. The operation was smooth and quiet. The concept is scalable to different size and shapes. The testing results showed this concept worked in all arrangements to reflect axial, lateral, longitudinal or radial motion directions. Testing results were obtained showingthat magnetic shock absorbers always out performed the common mechanical spring/air set up, and the magnetic shock absorber with side damping features performed best.

Conclusions/Discussion

The new magetic shock absorber concept was simple in construction, used less materials, were quiet and smooth operation, and had less contact surface(less friction and wear). It worked well in either axial, lateral, tangential or radial motion. Also, the magnetic forces could pass through plastic enclosure making this concept very suitable in fluid and piping system. It allowed to have minimal instrusion of extra mechanical parts into the fluid line, if required. Further more, this concept also could be extended to be used as a speed reducer, as a angular stabilization, or as a center stabilization.

Summary Statement

By rearranging magnets to act as cushion and also damping, I have created an innovative shock absorber design concept could be used for machines and vehicles.

Help Received