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**TOLEDO**  
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## Active Automotive Suspension System

In an active automotive suspension system both the stiffness and the damping in the system are actively controlled during operation. Active control results in superior ride quality, countering many undesirable aspects of a vehicle's ride, such as acceleration squat, brake dive, vehicle pitching at bumps and pits, and outward roll of the vehicle at corners. Presently, active control is achieved by replacing conventional springs and shock absorbers with hydraulic actuators. The primary draw-back in using a hydraulic system is its excessive weight, which detracts from a vehicle's fuel economy. Therefore, a system has been developed that uses piezoelectric materials and controls to change the stiffness and damping characteristics of conventional vehicle suspension systems. Piezoelectric regulation enables control of the vehicle in any desired ride mode, while overcoming the weight handicap of the available hydraulic systems. Piezoelectric materials undergo mechanical strains and change dimensions when subjected to an electrical field, and the response time of piezoelectric materials to any external loading is 10 milliseconds or less. Additionally, such a system will be quieter, and have lower power consumption than hydraulic systems. Finally, the excitation of a piezoelectric suspension system can be changed more rapidly than the pressure applied to a hydraulic actuator can be changed. A piezoelectric regulated system will therefore be able to respond to a greater number of ride disturbances per second than a hydraulic active suspension system.

The University of Toledo is seeking a company interested in utilizing this system that uses piezoelectric materials and controls to change the stiffness and damping characteristics of conventional vehicle suspension systems.

### **Applications:**

1. Vehicle suspension systems

### **Advantages:**

1. Light weight
2. Capable of rapidly and frequently reacting to changing driving conditions
3. Instantaneous detection of spring deflections
4. Programmable controller
5. Responds to control signals with a high degree of resolution
6. Lower power consumption
7. Less noise

**This invention is protected by issued patent: 5,390,949**

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