ABSTRACT

An electromagnetic linear generator and regenerative electromagnetic shock absorber is disclosed which converts variable frequency, repetitive intermittent linear displacement motion to useful electrical power. The innovative device provides for the superposition of radial components of the magnetic flux density within a coil winding array. Due to the vector superposition of the magnetic field and magnetic flux from a plurality of magnets, a nearly four-fold increase in magnetic flux density is achieved over conventional electromagnetic generator designs with a potential sixteen-fold increase in power generating capacity. As a regenerative shock absorber, the disclosed device is capable of converting parasitic displacement motion and vibration encountered under normal urban driving conditions into useful electrical energy for powering vehicles and accessories or charging batteries in electric and fossil fuel-powered vehicles. The disclosed device is capable of high power generation capacity and energy conversion efficiency with minimal weight penalty for improved fuel efficiency.Shock absorbers are essential components in vehicles, designed to absorb and dissipate kinetic energy generated by road irregularities, vehicle movement, and braking. Traditionally, shock absorbers serve a singular purpose: to enhance ride comfort and vehicle stability. However, recent advancements in technology have led to innovative approaches in utilizing shock absorbers as energy-harvesting devices. This paradigm shift has given rise to the concept of Shock Absorber Power Generation Systems (SAPGS), which aim to convert the mechanical energy dissipated during vehicular motion into electrical energy. offering a compact and efficient solution for energy harvesting. Hydraulic systems utilize the hydraulic fluid flow within the shock absorber to drive a turbine and generate electricity.