Flywheel Energy Storage Device for Hybrid and Electric Vehicles

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Technology Summary

This cost-effective technology stores and reuses what would otherwise be wasted energy inside a hybrid electric vehicle engine. The invention, a mechanical flywheel coupled to a rotor inside the engine, stores rotational energy during engine performance, subsequently feeding it back to assist with acceleration and braking.

The device significantly improves fuel efficiency and does not conflict with other energy storage components, such as batteries. No special container is required, as the flywheel operates at a lower power density. The rotors include a permanent magnet rotor and a magnetic coupling rotor, configured to act with a permanent magnet.

When the vehicle is in operation, an initial excitation source sets up a magnetic field. When power is applied to drive the permanent magnet rotor, magnetic coupling occurs between the permanent magnet rotor and the flywheel rotor, creating torque between them. Once higher speed is reached, kinetic energy is stored in the flywheel rotor. A secondary excitation source affects the second rotor. The sources are electrically connected for power cycling. In braking mode, power is taken away from the permanent magnet rotor and supplied back through coils to the flywheel rotor. The invention allows the relatively low power density of the second rotor to act as a component for relatively high-frequency energy cycling.

Advantages

- Rotor kinetic energy storage can be added without extra cost and without any system conflict
- No special housing is required
- Higher fuel efficiency

Potential Applications

- Electrical motors for hybrid and electric vehicles
- Can be applied in both axial gap motors and radial gap motors
- Utilities
- Defense
- Propulsion research

Patent

John Hsu, *Utilization of Rotor Kinetic Energy Storage for Hybrid Vehicles*, U.S. Patent 7,936,076, issued May 3, 2011.

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