Field Controlled Axial Flux Permanent Magnet Electrical Machine

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The Wisconsin Alumni Research Foundation (WARF) is seeking commercial partners interested in developing an electrical machine that combines a variable DC coil excitation with permanent magnet excitation to control flux in a cost-effective manner.

Overview

A continuing need exists for compact, efficient, inexpensive electrical machines with high torque capability over a large speed range and the ability to control machine speed. This need is particularly significant for electric drives in vehicles such as hybrid automobiles.

Permanent magnet machines have potentially greater capability than conventional AC and DC motors to meet these requirements; however, the attainable speed range of surface-mounted permanent magnet machines is limited, in part because they lack the capability to efficiently control flux.

The Invention

UW-Madison researchers have developed an electrical machine that combines a variable DC coil excitation with permanent magnet excitation to control the flux in a cost-effective manner. This design modifies the multiple-rotor, multiple-stator, axial-flux permanent magnet machine by adding one or two DC field windings to control the air gap flux and to provide a path for the DC flux through a modification of the rotor structure. The resulting field-controlled, axial-flux, surface-mounted permanent magnet machine offers a less expensive and more readily implemented flux control.

Applications

- Traction power applications
- Hybrid automobiles

Key Benefits

- Relatively inexpensive
- Offers higher torque per inertia ratio than the two-rotor field-controlled, axial-flux permanent magnet machine
- Easier to cool, due to increased stator surface area
- Easy field control feature

Additional Information

For More Information About the Inventors

- Thomas Lipo

Tech Fields

- Engineering : Electric machines

For current licensing status, please contact Michael Carey at mcarey@warf.org or 608-960-9867