

High-Strength Rotor Structure (#8083)

A rotor structure for ultra-high speed switched reluctance motors.

Georgia Tech inventors have created a new high-strength, high-torque density, and high-efficiency rotor for ultra-high speed switched reluctance motors. The invention has two parts: a rotor stack composed of electrical steel laminations and a non-magnetic shaft with two clamping arms. There, the rotor is buried inside the shaft between the rotor stack and two clamping arms. High-strength adhesives are utilized on the contacting surfaces. This smooth design results in less stress on the laminations. There is no shaft bore in the center of the lamination, which leads to stronger single piece laminations. Additionally, this structure does not increase the air gap length between the stator and rotor poles, resulting in a high torque density.

Benefits/Advantages

- **High strength** – due to reduction of stress in rotor laminations
- **High torque density** – due to the equivalent air-gap length not going through additional sleeve thickness
- **High efficiency** – air drag loss is significantly reduced due to cylindrical geometry
- **High reliability and simplicity** – does not require mechanical connections between the rotor and the shaft
- **Low cost** – lack of necessary mechanical connections results in cheaper assembly

Potential Commercial Applications

- Ultra-high speed applications
 - Printed Circuit Board (PCB) drills
 - Dental drills
 - High speed air compressors
- Vehicles
 - High speed E- turbo chargers

Background/Context for This Invention

Electric motors are vital components in various industrial applications. A good rotor design is the key to an efficient high power density electric motor. The current structure of rotors of ultra-high speed electric motors result in multiple inefficiencies such as low strength, manufacture infeasibility and inadequacy of working under high ambient temperature. There is a need to improve and invent a new rotor structure for ultra-high speed applications.

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More Information

Publications

[Prototype Video - High-Strength Rotor Structure](#), YouTube, August 6, 2020

[A Novel Rotor Design for Ultra-high Speed Switched Reluctance Machines over 1 Million rpm](#), IEEE, August 8, 2017

[Analysis of Rotor Robustness of Ultra-high Speed Switched Reluctance Machines over 1 Million rpm Using Cohesive Zone Model](#), IEEE, December 6, 2018

For more information about this technology, please visit:

<https://licensing.research.gatech.edu/technology/high-strength-rotor-structure>

Images:

