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Novel U-shaped Structure Switched Reluctance Machine With a Module Outer Rotor

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This paper presents a novel 16/12 outer module rotor-type switched reluctance machine. Unlike conventional structures, the rotor of the proposed structure includes a series of discrete module, and every outer module rotor is U-shaped structure and has two rotor pole. Each phase winding is composed of two series coils wrapped on two stator teeth. The short flux paths can be generated by excited adjacent phase and use the U-shaped module rotor. The module rotor can also decrease the mass of the rotor. The proposed structure may increase the electrical utilization, reduce magneto motive force requirement and decrease the iron loss compared with the conventional machine. To verify the proposed structure, the operation principle and the design rules of the proposed machine are illustrated and expounded. The finite-element method is employed to obtain both the static and dynamic characteristics of the conventional 16/12 and proposed machine. The simulation results are presented and analyzed to confirm the effectiveness of the proposed machine. Static performance shows that the average electromagnetic torque of module machine is larger than the conventional machine and the peak torque is also large than conventional machine. The copper loss in the proposed machine is smaller than the conventional machine. The iron loss in the stator is almost equal but the iron loss on the rotor of proposed machine is smaller than conventional machine. The efficiency of proposed modular machine is larger than conventional machine Because of the copper loss and iron losses of the proposed machine are all smaller than the conventional machine.

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