Magnetic Circuit Analysis and Control of a 2-Pole 3-Slot Structure Brushless DC Motor

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ABSTRACT

A traditional DC motor has a quite extensive application for a long time because it is simple to operate and control. However, the commutator of DC motor is unfortunately an extreme shortcoming. Because of the operation of brush, DC motor unavoidably has to be maintained regularly. Further more, it limits the life and performance of DC motor. On certain applications, there is a problem that DC motor can't break inherently, such as sparkle production or attrition of brush. Consequently, it becomes the only way that the motor manufacturer develops to make DC motor being brushless. The design of changing DC motor to brushless is studied in this thesis. First of all, decided the requirements and dimensions of motor, then, based on equivalent magnetic circuit and finite element method, analyzed critical parameters of brushless DC motor, such as air-gap flux density, torque, inductance, torque constant and back-emf constant etc. Afterward make selection materials of rotor magnet and stator iron to practice motor prototype. Finally, using experimental results verify simulation and analysis.

Keywords : brushless ; equivalent magnetic circuit ; finite element method

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