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(54) ANNULAR AXIAL FLUX MOTORS

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(57) **ABSTRACT**

An annular axial flux motor includes a rotor mounted on an annular subsection of a rotatable cam ring and a stator mounted on an annular subsection of a carrier frame. The rotor includes two Halbach arrays of permanent magnets spaced from each other on the cam ring along an axial direction. The stator includes multiple phase electrical windings printed on multiple layers of a printed circuit board (PCB) that are stacked along the axial direction. The multiple layers are positioned between the Halbach arrays, with active side of the Halbach arrays facing to opposite sides of the multiple layers. The Halbach arrays are configured to generate a symmetrical magnetic field and the multiple phase electrical windings are configured to have a same rotor-dependent torque constant, such that the stator can generate a constant torque to rotate the rotor and the cam ring within a finite travel range.