电机与电器

行波型旋转超声电机双路行波的运行机理

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摘要：

由于行波型旋转超声电机(traveling wave rotary ultrasonic motor，TRUM)存在着诸多非线性因素，双定转子TRUM中的双路行波输出性能还有待提高。基于单定转子TRUM理论，研究了双路行波运行的轴向组合振动特性和周向合成输出特性，分析了单转轴－双转子结构体的轴向振动模型，由于该结构体阻尼减振的不足，提出一种隔振设计解决方案。建立了双路行波周向合成的输出模型，并探讨了两路行波不一致时的输出特点。实验结果表明，与单定转子TRUM相比，基于隔振结构的新型双定转子TRUM的输出转矩提高了80%，功率密度提高了43.1%，且双路行波输出转矩的合成效率达到90%。该研究为扩展TRUM的应用范围提供了参考。

关键词： 行波型旋转超声电机   双路行波   运行机理   振动分析   输出特性

Operating Mechanism of Dual Traveling Wave of Traveling Wave Rotary Ultrasonic Motor

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Abstract:

Due to many nonlinear factors of traveling wave rotary ultrasonic motor (TRUM), dual traveling wave operation of TRUM with two stators and two rotors was inadequate. Based on the theory of TRUM with single stator and single rotor, axial vibration combination and circumferential performance synthesis of dual traveling wave were respectively researched. The axial vibration model of single axis and double rotors was analyzed, then a design solution for vibration isolation was proposed. The circumferential performance synthesis model of dual traveling wave was established, and the characteristics of two inconsistent waves were discussed. The results show that the dual traveling wave operation with vibration isolation structure has obvious advantages to the single one: output torque is increased by 80% and power density is increased by 43.1%. And the torque synthesis efficiency of dual traveling wave operation is up to 90%. These researches offer theoretical basis and design approach to extend the applications of TRUM.

Keywords: traveling wave rotary ultrasonic motor (TRUM)   dual traveling wave   operating mechanism   vibration analysis   output characteristics

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