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电机与电器

压电叠堆泵驱动的精密步进驱动电机

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摘要： 提出一种新型压电直线精密步进驱动电机，其结合电流变技术替代机械阀装置，由此实现高精度和高速的性能。该步进驱动电机采用压电泵作为步进驱动动力源，以压电叠堆的伸缩和薄壁蝶形铰链微变形结构驱动泵腔容积的变化，进而控制精密液压缸完成步进运动。解决了以往压电精密步进驱动电机钳位不牢固、步进频率较低、行程小、分辨率低、速度低、驱动力不稳定等问题。研制的压电叠堆泵直线步进驱动电机能够实现高频率(100 Hz)，高速度(502 mm/s)，大行程(>10 mm)，高分辨率(0.05 mm)，大驱动力(100 N)等特点，提高了压电型步进驱动电机的整体驱动性能。该步进驱动电机在精密运动、微操作、光学工程和精密定位等精密工程中有广阔的应用前景。

关键词： 压电步进驱动电机 压电泵 精密 柔性铰链 大行程

A Novel Precision Step Motor Based on Piezoelectric Stack Pump

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Abstract: A novel precision piezoelectric step motor is proposed and its combination of electrorheological (ER) technology as an alternatives to mechanical valves device, thus achieving high precision and high-speed performance. The step motor is driven by the piezoelectric pump. The principle is the volume change of the chamber caused by thin-walled butterfly stretch and deformation of the hinge structure and this drives the precision hydraulic cylinder to complete a step. It adopts the principle of bionics and works with a new method of piezoelectric stack pump and a distortion structure of thin flexible hinge. It solved problems of the past piezoelectric precision stepper motor that the anchoring/loosen isn’t enough, low stepper-frequency and velocity, small travel, low resolution and the driving force of instability. The experiment shows that the novel linear piezoelectric step motor worked with high frequency (100 Hz), high speed (502 mm/s), large travel distance (10 mm), high resolution (0.05 mm) and high load (>100 N). This kind of new piezoelectric step motor will be applied for large travel distance and high resolution driving device, optics engineering, precision positioning and some micro-manipulation field.

Keywords: piezoelectric step motor piezoelectric pump precision flexible hinge long stroke

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