

电机与电器

一种新结构的双向直线运动驻波型超声波电机

王波¹, 戴吉岩², 郭吉丰¹, 魏燕定¹

1. 浙江大学电气工程学院

2. 香港理工大学应用物理学系

摘要: 研究了一种新结构的双向运动直线超声波电机。该种直线超声波电机由一块在两端部开槽、形成2个薄弱环节的板构成。通过有限元分析可知, 调整薄弱环节和两端部的尺寸, 在板中间可以形成2个波长几乎相等的驻波模式, 其中一个是正弦振型, 一个是余弦振型; 通过粘贴8片PZT4压电陶瓷在板的中间来激励这2种振动模式。依照该原理, 设计制造并研究了长60 mm、宽10 mm的新型双向直线运动超声波电机。该直线超声波电机在一个方向上最大速度220 mm/s, 最大出力1.764 N, 在另一个方向上最大速度270 mm/s, 最大出力1.96 N, 且达到了0.2 mm以下的分辨率。

关键词: 双向运动 驻波型 直线超声波电机 压电陶瓷

A New Structural Bi-directional Linear Moving Standing-wave Type Ultrasonic Motor

WANG Bo¹, DAI Ji-yan², GUO Ji-feng¹, WEI Yan-ding¹

1. College of Electrical Engineering, Zhejiang University

2. Department of Applied Physics and Material Research Center, the Hong Kong Polytechnic University

Abstract: A new trial of bi-directional moving linear ultrasonic motor (LUSM) using a new structure has been studied. This linear ultrasonic motor is composed of a single plate which was chiseled two grooves in both terminal parts to form two weak links. By adjusting dimensions of weak links and terminal plates, finite element modeling analysis revealed that two standing wave modes, i.e., one in sine vibration mode and the other one in cosine vibration mode, with nearly the same wavelength can be formed in the middle part of the plate. With eight pieces of PZT4 piezoceramics mounted to the middle plate to excite the local vibration, a new type of bi-directional linear moving ultrasonic motor of 60 mm in length and 10 mm in width has been designed, fabricated and characterized. The following performances have been achieved: maximum velocity 220 mm/s, maximum output force 1.764 N in one direction and maximum velocity 270 mm/s, maximum output force 1.96 N in another direction, and resolution better than 0.2 mm.

Keywords: bi-directional moving standing-wave type linear ultrasonic motor piezoceramic

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通讯作者: 王波

作者简介:

作者Email:

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