



Non-Confidential Description - PSU No. 2623

"Piezoelectric Shear-Shear Mode Motor"

Keywords:

piezoelectric motor, shear-shear

Links:

[Inventor website](#)
[U.S. Patent #7,095,160](#)

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Background

Piezoelectric ultrasonic motors have exceptional properties, such as high resolution of displacement control, an absence of parasitic magnetic fields, frictional locking at the power-off stage, and high thrust-to-weight ratio, all of which make them good candidates for use in precision micromechanical systems (in medical devices, for example). However, they also have several disadvantages, including a need for high voltage, high frequency power sources, and potential wear at the rotor/stator interface. While conventional piezoelectric ultrasonic motors provide satisfactory performance, they primarily utilize a transverse length extension mode for exciting a traveling flexure wave with a low piezoelectric effect. In the operational mode, the relatively low effects of the piezoelectric ceramic material hinders additional development of these types of motors.

Invention Description

This disclosed invention is a piezoelectric motor and a method of exciting an ultrasonic traveling wave for driving the motor; the invention includes a method for driving a rotary motor using a rotary shear vibration mode, as well as a method for driving a linear ultrasonic motor using the linear shear vibration mode of piezoelectric ceramics. Because of higher values of the electromechanical coupling factors k_{15} in perovskite type piezo-ceramics, these shear-motors exhibit better motor performance.

Advantages/Applications

- Reduced size and increased efficiency compared to other piezoelectric motors
- Increased output of mechanical energy
- Easier to miniaturize

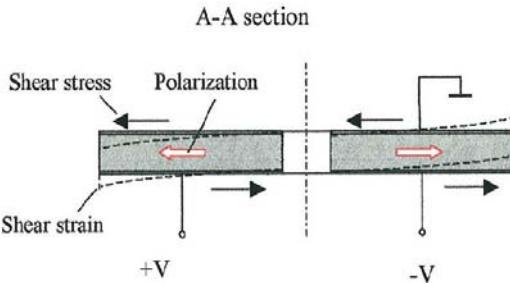


Fig 1: Operation principle of flexure vibration using shear-shear mode