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A Paper or Card Forwarding Device Using a Flat-Type Ultrasonic Motor

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This paper deals with a paper or card sheet forwarding device using a flat-type ultrasonic motor, that is, a motor which uses a longitudinal-bending multimode vibrator of rectangular form. The mechanism involved in the forwarding of a sheet of paper is described along with various device characteristics. The results indicate that this device can be expected to be a new piezoelectric actuator of thin form.

1. Introduction

With progress in the development of piezoelectric materials, new piezoelectric actuators have attracted attention in many fields.[1] Development and application of the actuators, which use a powerful ultrasonic vibration produced in a piezoelectric vibrator, are anticipated especially in ultrasonic motors, because they are based on a new principle. In fact, they are entirely different from the present motor applying the interaction of electric and magnetic fields.

This paper outlines the study of linear-type ultrasonic motors[2–4] which enable feed-forwarding of a sheet of paper or a card, and clarifies the mechanism of actuation and the characteristics of these devices.

It is generally considered that the first ultrasonic motor was invented by Sashida[5] in 1982, although theories of the application of ultrasonic vibration to a