

## 고 출력 진행파 회전형 초음파 모터의 설계 Design of high power traveling wave rotary type ultrasonic motor

오진현, 임기조  
Jin Heon Oh, Kee Joe Lim  
충북대학교  
Chungbuk National University

**Abstract** : In this paper, we propose a novel type shaft-less ring type ultrasonic motor. A traveling wave rotary type ultrasonic motor is selected as a base model. The newly designed stator has two piezoelectric ceramic rings which are bonded in sandwich shape as traveling wave generator. So, we can expect to produce higher torque. The proposed model has the rotor structure that coupled with the stator provokes the pressure, this model do not install the separate plate any spring device. We used the finite element method to verify the operation principle and to compute the vibration mode of proposed model.

**Key Words** : Ultrasonic motor, Traveling wave, High power, Finite element method

### 1. 서 론

Ultrasonic motors have been researched as one of the important actuators which used for robotic and planetary applications. In this application field of actuator, accurate and sensitive operation, small volume, certain level of mechanical output characteristics are required[1]. Therefore, the ultrasonic motors are considered as appropriate actuators on the above mentioned sphere. However, these applications are limited at present because the currently available ultrasonic motors do not provide adequate high torque and power. And, these motors need pressure mechanism between stator and rotor because of using the turning force created by the friction between them. To pressurize in these type motors, additional components and particular structure is required. So, these features act as limited elements in the realization of volume reduction, lightweight, simplification of motors.

### 2. 결과 및 토의

The newly designed stator has two piezoelectric ceramic rings which are bonded in sandwich shape as traveling wave generator. So, we can expect to produce higher torque. The proposed design of high torque generation principle can be confirmed simply as two rollers and one slide system. By rotating rollers in the opposite direction, the resultant thrust force is sum of the individual forces of two rollers[2]. The stator for high torque generation was designed. Also, the rotor structure is designed to produce the pressure by the stator vibration. Hence, the proposed model has the rotor structure that coupled with the stator provokes the pressure, this model do not install the separate plate any spring device. We used the finite element method to verify the operation principle and to compute the vibration mode of proposed model. And, to demonstrate the simulation results, a prototype motor was fabricated and the performance test was conducted.

### 감사의 글

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† 교신저자) 임기조, e-mail: kylim@cbnu.ac.kr, Tel: 043-261-2424  
주소: 충북 청주시 개신동 충북대학교 전기공학과