'Seal Mechanism' with 3 Degrees of Freedom

Background and problems

- Coarse and fine motion device with multiple degrees of freedom (DOF) for scanning probe microscope (SPM)
- Complex structure

Solution

- "Seal Mechanism" utilizing difference of frictional forces among clamps

Advantages

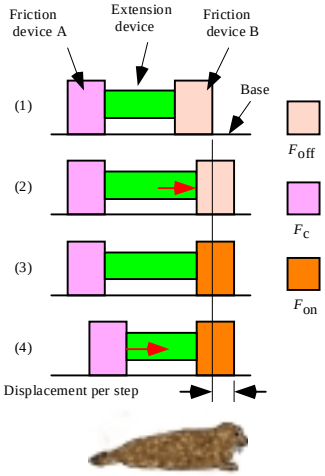
- Smaller number of controlled actuators and smaller number of driving steps in a cycle than Inchworm mechanism
- Coarse motion by on-off control of piezoelectric actuators
- Fine motion by changing length of piezoelectric actuators continuously

Results

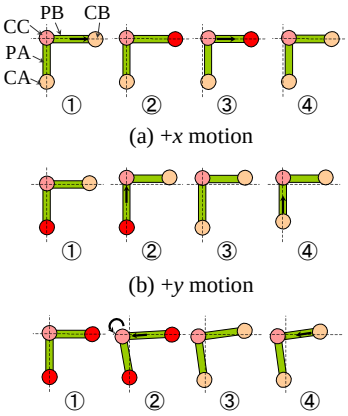
- 3-DOF device by using piezoelectric actuators and electromagnets
- Equivalent performance to Inchworm mechanism
- Positioning in each direction

Applicable fields

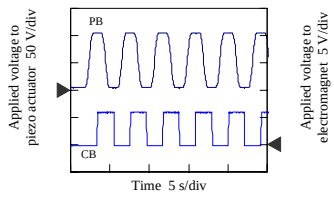
- Positioning device for measurement instruments such as SPMs
- Adjustment of parts in assembly process



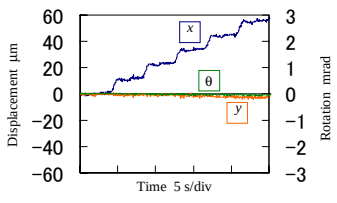
Principle of movement of 1-DOF mechanism



Principle of movement of 3-DOF mechanism

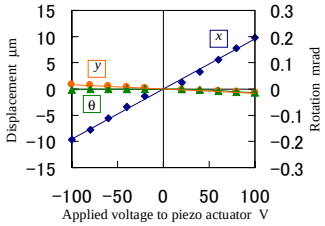


Voltage patterns

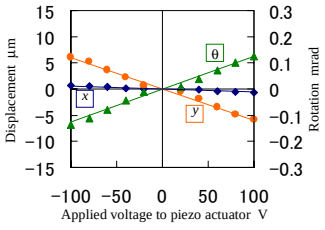


Movement

Example of movement

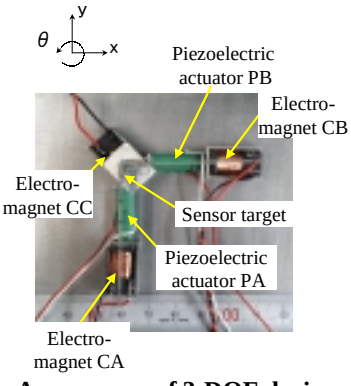


x *motion*

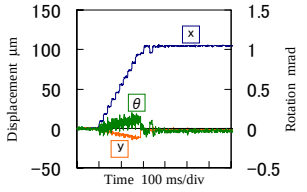


Rotation

Displacement/ interference vs. voltage



Appearance of 3-DOF device



Positioning examples (+x=100μm)

URL: http://www.toyota-ti.ac.jp/Lab/Kikai/5k60/

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