Precise rotational motion mechanism for refocusing mirror on UHV around three perpendicular axes

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It is desirable that the rotational centre of a precise-motion mechanism coincides with the focusing point of the refocusing system. However, the optimal reflection area on a mirror does not usually coincide with the rotational centre of the mechanism that holds the mirror. In such cases, when the mirror held in the mechanism is rotated, the beam moves away from the optimal reflective area on the mirror. Since a gyroscope mechanism can be driven independently on three axes, the distance between the axes can be reduced without interfering with each other. Using this mechanism, the reflective position on the mirror surface can be located near each rotation axis of the gyroscope. Thus, we developed a precise rotational motion mechanism for a refocusing mirror on UHV around three perpendicular axes by using the gyroscope mechanism.

The features of the mechanism are listed as below:

○ Since the gyroscope mechanism is used, the mirror holder can be rotated independently around the three axes and the rotational centre of these axes is the same.

○ The optimum reflective position on the mirror surface can be located near each rotation axis of the gyroscope.

○ It can be used on UHV.

○ The minimum movable angle is less than 0.1 second.

○ Since the piezo motor generates negligible amount of heat, its movement due to the heat is very less; therefore, it can be used on a high-precision refocusing system.

○ The range of the movable angle is 2 degrees, and since it is highly precise, it is useful on an optical system for glancing incidence.

○ When the motor is removed, a 360 degree rotation is possible for all axes. The distance between any two axes is approximately 10 micrometer.