Tohoku Univ. Technology

Absolute position measurement device and measurement method

High resolution and high accuracy absolute position measurement using diffracted light

Overview

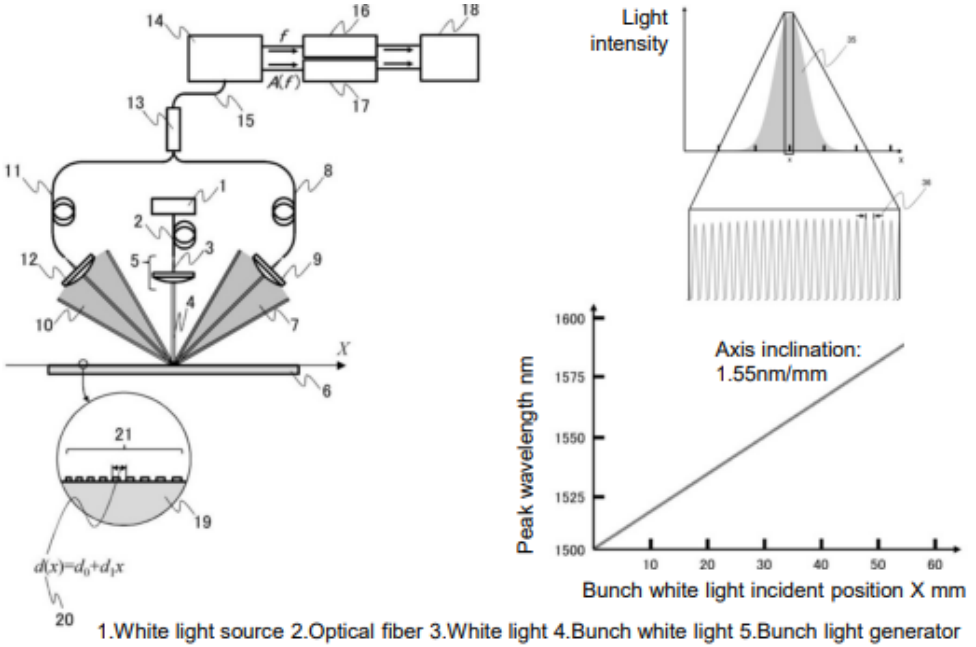
Optical linear encoder is used as high accuracy displacement sensor for semiconductor manufacturing equipment and various absolute position detection methods have been implemented. However, complex micro-pattern combinations and detection opticsare necessary. For this purpose, an optical single-axis encoder thatuses white light source and diffraction grating with unequal tickspacing is proposed to detect the absolute position based on the spectrum of the analyzer. However, the rotational motion error of thegrating affects the position detection.

The present invention is able to provide an optical absolute positionmeasurement device and method with high resolution and accuracyin single or double axis by analyzing the spectrum of a diffractedbunch light. An unequal spaced grating is provided to incident thebunch white light, and the absolute position is detected from the peakwavelengths detected on the optical spectrum of the analyzer.

Product Application

- High resolution & accuracy optical absolute position measurement device
- - Eliminate the effect of rotational motion error by using diffracted light
- Semiconductor manufacturing equipment
- Machine tools in factories

Features・Outstandings



1.White light source 2.Optical fiber 3.White light 4.Bunch white light 5.Bunch light generator 6.Unequal grating spacing 7.1st order reflection diffracted bunch light 8/11.Optical fiber 9/12.Focusing lens 10.-1st order reflection diffracted bunch light 13.Optical coupler 14.Analyzer 15.Fiber 16/17/18.Signal processing 19.Diffraction grating substrate 20.Grating spacing 21.Single axis grating pattern 35.Interference signal 36.1/2period of grating spacing

【Up left】Schematic view of the optical system of the absolute position measurement device
【Up right】Change in optical intensity due to wavelength λ(x) scale shift in the optical spectrum
【Down left】Transition of the peak wavelength coupled to an optical fiber at the x position of the optical system of the absolute position measuring device

IP Data

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