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Design And Analysis Of Xy Positioning Table

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Abstract: Flexure mechanisms have massive range in various industrial application required for high precision and frictionless motion. There are many study on concept to make precision manipulators, but only some of them can achieved to satisfy the high speed with precision. Pro-E software is used for parametric modeling of XY positioning table ANSYS is used for Static analysis and dynamic analysis . Deflection of motion is concluded by static analysis with force. The Deformation of XY mechanism is equivalent to S-shaped cantilever beam deformation. Force and deformation curve is linear. There results get compare with mathematical calculation with FEA results.

Keywords: Flexure Mechanism, FEA, XY positioning**.**

1. Introduction

When Flexure mechanisms uses as bearing to provide smoothen motion. A flexure mechanism is a single-piece mechanism that transfers movement without any relative motion between joints or linkages, thus motion is wear free, energy efficient, higher resolution, and high speed device. Flexures are structure that depends on Material elasticity for their functionality. Motion is generated due to deformation at molecular level, which results in primary characteristic in flexures- smooth and precision motion for example in camera lens cap, laser scanning machine.

In this paper a flexural mechanism is designed to provide a linear motion in a compliant manner. Flexure mechanisms offer a number of advantages, such as increased precision, reduced friction and wear, simple (sometimes monolithic) construction, and reduced assembly. In many ways compliant mechanisms have developed similar functionality to rigid mechanisms. Flexure mechanisms could potentially offer an attractive choice to conventional linear motion mechanisms both in terms of improved functionality and decreased cost. Because flexure mechanisms gain some or all of their motion from deflection of the linkages, they have the potential to completely eliminate relative motion between linkages, and thus eliminate friction. As an added benefit, since mechanism members couple its energy storage with linkage motion as they deflect, stable positions can be integrated into the design. [3] [4]Several linear motion flexure mechanisms, including bi-stable mechanisms, have been developed, although they provide much less travel for their size compared to prismatic joints. Unfortunately, mechanisms that do have a longer travel often have significantly reduced off-axis stiffness due to the use of long flexural members.

2. Modeling and Analysis of XY Flexure mechanism

Based on the designs studied we found out that the all the mechanisms were based on flexural motion. An elastic strip is made to bend or twist causing distortion in its original dimensions and producing the desired motion. After studying various existing mechanisms, we tried designing our own mechanism based on Flexural Force Transmission

Trial Models

2.1 Single Beam(Rectangular) Hinge Type Flexure Mechanism

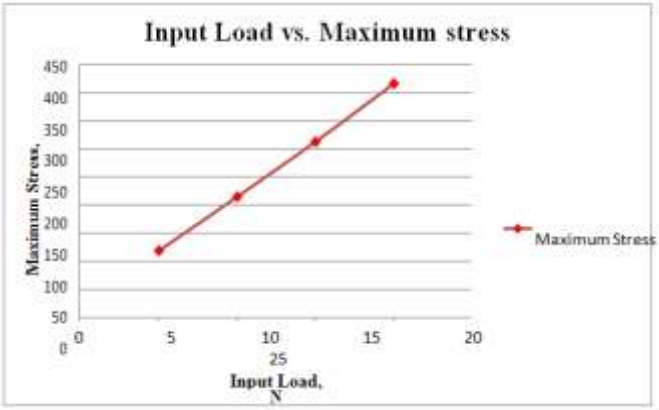

Figure 12: Input Load Vs Maximum stress Y-Direction

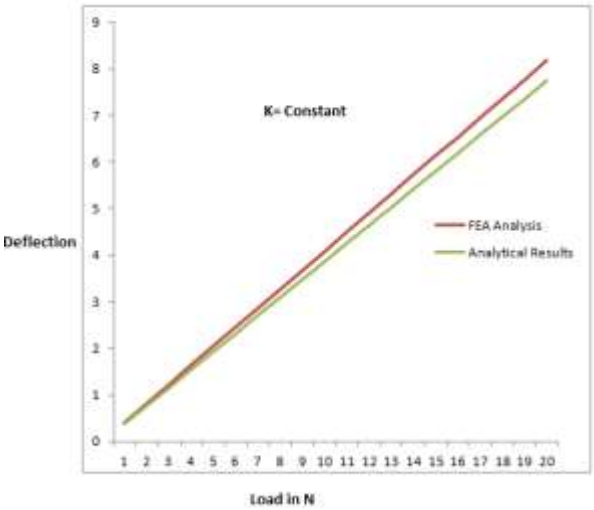

Figure 13: Input Load Vs Maximum Load

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Author Profile

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