

International Conference on

Smart Materials & Structures

June 15 -17, 2015 Las Vegas, USA

Design of a locking device for an SMA driven feed axis

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In a current research project, the Chair of Production Systems is examining the use of multiple modular and standardized shape memory alloy (SMA) actuators in the feed axis of a small machine tool. Three linear axes will be combined to achieve tool movements in three dimensions. Later on, these machines shall be used to manufacture small work pieces with high precision. Therefore, the axis must be qualified to handle movements in the micrometer range.

In addition to investigating different measures to control the displacement of the actuators, a way to lock the axis to any desired position is needed. This enables the user to hold the axis in the same position for a period of time without heating the individual SMA actuators. Therefore the durability of the assembly will be increased. Further, this setup is beneficial for carrying out precise drilling operations and for isolating the movement of one of the three linear axes by locking down the other two.

Considering the small dimensions of the axis assembly and the accompanying high demands on the manufacturing process, a simple lock bar mechanism was chosen. A brake pad is pressed against the base plate of the axis by a pressure spring. In order to deactivate the latching, the brake pad is pulled up by an SMA wire, the brake pad actuator. Afterwards the spring-powered lock bar moves under a shoulder and holds the brake pad in its upper position.

Biography

Jan Pollmann has completed his diploma in mechanical engineering at Ruhr University Bochum and is currently working on his PhD as a Research Assistant at the Chair of Production Systems. He has published several papers in reputed journals regarding the use of SMA actuators in linear feed axis.

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