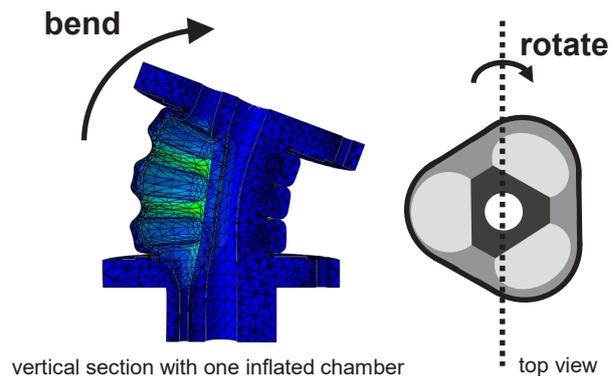
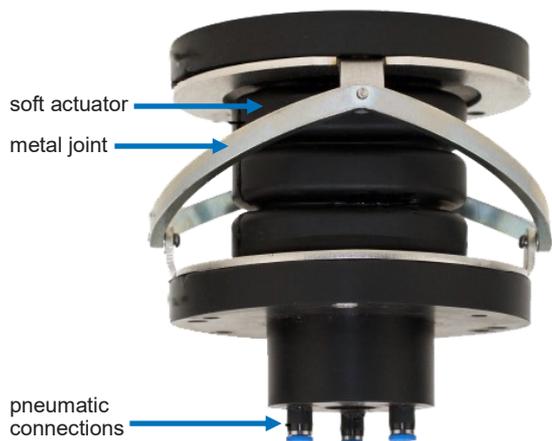


Licensing Opportunity

Hard-soft actuator for two axes rotation



(left) Hybrid actuator with a two degrees of freedom metal joint and ribbed pneumatic chambers. (right) The soft actuator consists of three pneumatic chambers. Differences of the pressure in the inflated chambers lead to bending of the actuator and, thus, allow two axes rotation.

Summary

A hybrid actuator with adjustable impedance moves elements such as solar panels on building envelopes with precision and at the same time demonstrates great resilience towards severe weather.

Background

Hard actuators are good at positioning and locking a configuration. Soft actuators excel in absorbing mechanical shocks and damping of vibrations. Both attributes from hard and soft actuators are desired for dynamic elements on buildings such as shades, mirrors or solar panels.

Invention

A hard pivotal joint is combined with a soft pneumatic actuator. The joint prevents motion along and rotation around the longitudinal axis. At the same time a pneumatic control system adjusts the pressure in the three pneumatic chambers. A difference in the pressure between chambers induces a bending. The overall pressure levels control the stiffness.

The pneumatic chambers are produced as a unitary body using injection molding, which is a facile and economical fabrication process. Prototypes have been produced in an industry-ready setting.

Features & Benefits

- Lightweight (300 g), robust and resilient design
- Easy maintenance due to low number of components and no mechanical parts such as motors
- Low cost fabrication process

Fields of Application

- Robotic joints
- Building technology, energy technology

Patent Status

- Patent pending (WO 2019/096642 A1)

Publication

- Svetozarevic B. et al. "Dynamic photovoltaic building envelopes for adaptive energy and comfort management" *nature energy*, 2019
<https://doi.org/10.1038/s41560-019-0424-0>

Technology Readiness Level



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