High Performance X-shaped Passive Control Anti-vibration Structure

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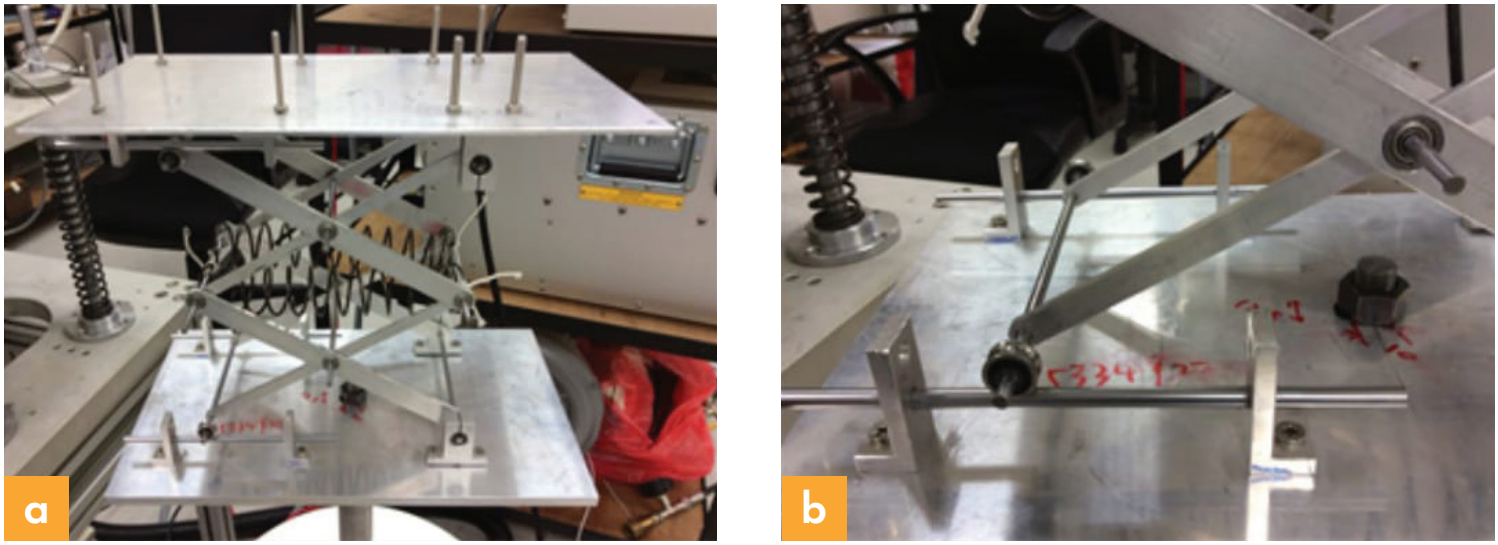

A prototype of the SLS platform: the prototype (a) and rollers in a horizontal track and bearings in rotational joints assembled in the system (b).

The X-shaped bio-inspired structures are novel designs of passive vibration isolation systems by using only linear spring and damping components to achieve superior nonlinear vibration isolation. The technology provides excellent passive quasi-zero stiffness of high loading capacity, and nonlinear high damping at resonant frequencies but low at others, without unstable nonlinear equilibrium. The structure can provide flexible and adjustable stiffness up to zero and adjustable nonlinear damping characteristic. The stiffness is decreasing with the increase of compression or extension of the structure, different from existing spring systems which have higher stiffness subject to more compression or extension. The technology is easy to implement and flexible in usage of low cost. The systems can be with n-layers of X-shaped structures to suit different applications, such as leg/joint design of robots, limb-like structured suspension for mobile robots with track, protection of high-precision machinery, space launch and on-orbit applications.

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