

Department of Mechanical Engineering

More info & contact:

Technology Transfer Interface

R&D Department

Hugo Loosvelt

[T]: +32 (0)2 629 38 65 or 22 07

[E]: hloosvel@vub.ac.be

[W]: www.vub.ac.be/technologytransfer

Torsion spring with variable stiffness

Mechanical springs are used in almost all mechanisms. They can be used to reduce shocks, apply a force, store energy or change natural frequencies. The major drawback is that the spring stiffness is constant, and thus is chosen during design and optimized for one working condition. Active controllable springs exist, but these devices consume continuously power, which is the reason why they are usually avoided to lower operating costs.



Technology Description / Special Features

This design developed by the Vrije Universiteit Brussel realizes a torsion spring, of which the stiffness is changeable during normal operation. Since only standard components are used, the cost of implementation of this new technology into existing applications is low. It has a limited number of design parameters, which simplifies the implementation, although gives enough freedom to tune the characteristics for each specific application. The device is scalable and the power source used to vary the stiffness may be electrical, pneumatic or hydraulic. During normal operation as a torsion spring no power is required, only when the stiffness is varied. This can be done at every moment in time during normal operation. A demo setup is built to show the working principle.

Innovation Strengths / Competitive Advantage

This design has a number of advantages, depending on the application.

- By optimizing the stiffness repetitive processes, e.g. like most manufacturing, become more energy efficient.
- Devices that interact with humans are more personalized, since each person can choose ideal softness. This implies more costumers will be satisfied with fewer different products.
- Lower design cost since stiffness does not have to be defined in an early design stage, but adjustments are even possible by stores or retailers.
- In automotive industry the stiffness of suspension of vehicles is easily tuned for the driver's convenience, or optimized for the load and speed of the car, or for the surface or curves of the road.
- Agricultural machines contain many springs. Depending on the type of harvest, humidity or structure of the ground stiffness variation results in better grading and cleaner harvest.
- Stiffness of lower leg prosthetic and orthotic devices is adjustable for each single person and even for different walking speeds or terrains.

Market Opportunities / Industrial Target Group

The use of variable stiffness to increase comfort or to reduce energy consumption is slowed down due to a lack of simple and cheap designs. The ability to vary stiffness during operation reduces design costs and allows optimization for each working condition. This optimization can be done either to lower energy consumption, enhance user comfort or vibration reduction.

The presented design is a basic mechanical component which is applicable in a large variety of industries e.g. to improve automotive applications, to tune agricultural machines, make manufacturing processes less energy consuming or to enhance the comfort of prosthetics devices.

IP Status

A patent application for this design has been filed in Europe, US and Canada.

Collaboration Details

Vrije Universiteit Brussel is interested in entering into license agreements, partnerships and joint R&D projects to implement this design into your applications

Inventors

Dr. Ronald Van Ham
Department of Mechanical Engineering
VUB-IR-MECH - Pleinlaan 2 - 1050 Brussel
Phone: +32 4 97 87 31 17
Ronald.Van.Ham@vub.ac.be

Keywords

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