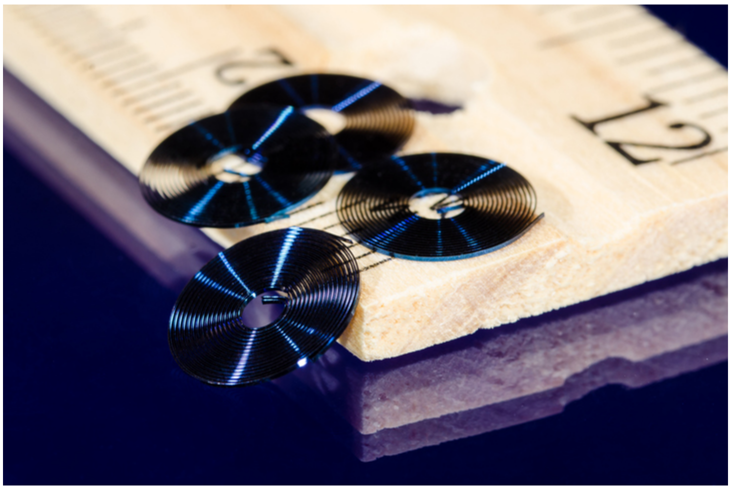
INNOVATION PARTNERSHIPS
UNIVERSITY OF MICHIGAN

Self-Biased, Mass-Loaded Miniaturized Magnetoelastic Resonators

TECHNOLOGY NUMBER: 2019-376



Technology ID
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Category
Hardware
Engineering & Physical Sciences
Semiconductor, MEMS, and Electronics

Inventor
Jiqing Jiang
Ramprasad Mohanan Nambisan
Scott Green
Yogesh Gianchandani

Further information
Joohee Kim
jooheek@umich.edu

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OVERVIEW

Miniaturized magnetoelastic resonator with stable operating frequency for various applications

- Resolves increased frequency issues in smaller resonators by innovative mass-loading
- Applied in sensors for security tags, pressure sensors, wireless communication

BACKGROUND

Magnetoelastic resonators have long been used in various sensing and tagging applications due to their sensitivity to external magnetic fields and mechanical vibrations. Traditional designs often trade miniaturization for increased resonant frequencies, necessitating complex modifications to the associated transmission and reception systems. This balance poses significant challenges in applications where space is limited, yet consistent operating frequencies are crucial, such as in embedded sensor networks or compact anti-theft systems. Historically, attempts at reducing the resonator's size led to inefficient signal reception and processing difficulties. Alternatively, reducing stiffness or inserting perforations degraded the resonator's signal amplitude. These drawbacks highlight the need for a novel approach to achieve miniaturization without sacrificing efficiency or requiring extensive hardware revisions.

INNOVATION

Researchers at the University of Michigan have developed a mass-loaded, self-biased magnetoelastic resonator maintaining a steady resonant frequency irrespective of size reduction. By strategically attaching mass at the resonator’s ends, this novel design effectively counteracts the frequency increase typically associated with reduced dimensions, preserving expected performance without altering companion systems. This technique leverages finite element analysis for precision design and employs permanent magnetic masses to ensure adequate biasing, thereby achieving signal amplitudes similar to those of larger resonators. The potential applications span electronic article surveillance systems, wireless sensing, and pressure monitoring technologies, where size and efficiency are critical. This advance significantly enhances the versatility and implementation scope of magnetoelastic resonators.

ADDITIONAL INFORMATION

INTELLECTUAL PROPERTY

US11658638 "Magnetoelastic resonator and method of manufacturing same"