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Apparatus and Method for Neurostimulation by High Frequency Ultrasound

AzTE Case # M12-087

Inventors

Bruce Towe
Professor
School of Biological and Health Systems Engineering
Arizona State University

Invention Description

Wireless needle-sized neurostimulators powered by ultrasound technologies provide a new method of applying electrical stimulation to tissue. Current approaches involve either the direct application of current to tissues via pacemaker-sized implanted devices or indirect application of electrical currents through the body surface. Unfortunately, implanted neurostimulator devices can be bulky and application of electrical currents to the body surface has specificity and depth problems due to diffusion and high electrical losses in tissue.

Professor Bruce Towe, of Arizona State University, has developed further additions to his portfolio of miniature ultrasound neurostimulation technologies. The latest additions utilize wireless stimulation waveform monitoring, stimulation current feedback control, and electrode-tissue impedance monitoring, all of which allow for improved and efficient ultrasound neurostimulation of different nerves and tissues. This device system also incorporates new safety improvements that limit the amount of current transmitted to the body tissue.

With the addition of this new ultrasound neurostimulator system design to his expanding repertoire, Dr. Towe continues to be at the forefront of the microscale neurostimulator field and builds upon an already impressive portfolio of ultrasound and microwave-based neurostimulation technologies.

Potential Applications

- Ultrasonic miniature neurostimulators can be placed in the:
  - Spine for pain control
  - Brain for Epilepsy
  - Near the occipital nerve for migraine
  - Vagus nerve stimulation for epilepsy
  - Muscle for functional electrical stimulation

Benefits and Advantages

- Passive, miniature implanted stimulator form factor – doesn't require use of a battery
- Much lower power consumption compared to rf microwave or coil inductive powering methods
- Incorporates an electrode-tissue impedance sensing for improved implant functionality and performance monitoring
- Improved implant visualization and localization with ultrasound imaging systems

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Intellectual Property Status:

Patents Pending

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