Washington University in St. Louis
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NEURAL INTERFACE DEVICE FOR COMPLEX, SPECIFIC STIMULATION OF PERIPHERAL NERVES

Christiansen, Blaine, MacEwan, Matthew, Moran, Daniel

Weilbaecher, Craig

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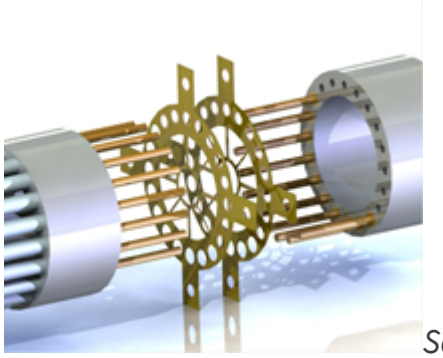
Technology Description

This technology is patented bipolar sieve electrode designed to stimulate peripheral nerves in a specific direction and thereby expand the potential of using this type of neural interface device in clinical applications such as nerve regeneration and prosthetics.

Sieve electrodes are thin film devices that can record and stimulate peripheral nerves with great precision. However, their applications are currently limited because their unipolar design generates non-specific action potentials that travel in two directions (distally toward muscle/sensory organs and proximally toward the spinal cord) which may interfere with normal neural signaling To solve this problem, Prof. Daniel Moran and colleagues designed a bi-laminar, bipolar sieve electrode that is capable of inducing signals in a single, specified direction to replicate normal nerve activity. The electrode is fabricated by fusing two "traditional" sieve electrodes back-to-back in order to create an electrode that has active ring electrode holes on both faces of the device. This technology could enable complex stimulation patterns that expand the clinical and research uses for sieve electrode neural interface devices, particularly neuroprosthetics.



Schematic drawing of bipolar sieve electrode using pins or microwires to interface the contact pads of traditional electrodes fused back-to-back.

Stage of Research

- **Simulations** – the inventors performed computer modeling to optimize the design and validate the electrode's neurostimulatory capabilities
- **Prototype** – the inventors fabricated single-sided sieve electrodes (not yet fused) and tested them in an animal model to demonstrate the intimate interface with peripheral nerve tissue

Applications

- **Neural interface device** – sieve electrode to stimulate peripheral nerve function with end-user

applications such as:
- neural regeneration – restore sensory and motor function in paralyzed patients
- neuroprosthetics – enable neural control of prosthetic limbs etc.
- brain-computer interfaces
- neurological research

Key Advantages

- **Specific, complex stimulation patterns** to replicate normal nerve activity
  - designed to stimulate peripheral nerves specifically in one direction (either distally toward the muscle/sensory target or proximally toward the spinal cord) by using two electrodes per active pore
  - expands the clinical applications for this type of neural-interface device

Patents - Bipolar sieve electrode and method of assembly (U.S. Patent No. 8,792,973)

Website - Moran Lab