Intelligent Flexible Spinal Cord Stimulators For Pain And Trauma Management Through Neuromodulation

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SUMMARY

UCLA researchers in the Department of Neurosurgery and Electrical Engineering have developed a novel closed-loop spinal cord stimulator device that is small and flexible.

BACKGROUND

Over 30 million patients in the US suffer from cervical or neck pain, and the market for neurostimulation is expected to exceed $2 billion by 2020. Spinal cord stimulation (SCS) therapy consists of embedding devices in the skin above the spinal cord, masking pain signals before they reach the brain. Existing SCS systems only have up to 32 electrodes per square centimeter and utilize complex architectures, with a large battery and many wires and leads. The most common side effect with SCS use is lead migration or breakage and infection; extensive lead migration may require reoperation to position the wires correctly. Additionally, patient response to SCS systems varies greatly, requiring individualized tuning to optimize pain relief.

INNOVATION

Professor Iyer and coworkers have developed a novel SCS device that is small, flexible, and can autonomously adjust stimulation patterns for maximum efficacy. The SCS chip can be easily manufactured using microfabrication technology with a high density of electrodes (>1000 cm^{-2}), significantly more than existing systems (32 cm^{-2}). Batteries can be embedded onto the device, eliminating the need for leads and wires. Additionally, on-chip machine learning enables the optimization of stimulation patterns based on individual patient and posture for efficacious pain management.

APPLICATIONS

- Treatment of cervical pain
- Treatment of neck pain
- Neurostimulation

ADVANTAGES

- >1000 electrodes/cm^2
- All circuity located on a single flexible platform
- On-chip machine learning will generate personalized stimulation patterns
- Device design will eliminate common SCS use side effects
- Non-opioid pain management system

PATENT STATUS

Country	Type	Number	Dated	Case
United States Of America	Issued Patent	11,992,686	05/28/2024	2018-385

ADDITIONAL TECHNOLOGIES BY THESE INVENTORS

- Flexible And Stretchable Interconnects For Flexible Systems And Flextrate(Tm)

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INVENTORS

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OTHER INFORMATION

KEYWORDS

Spinal cord stimulator; internal pulse generator; flexible electronics; poly(dimethylsiloxane); spinal cord; pain management; neurostimulation

CATEGORIZED AS

- **Biotechnology**
  - Health
- **Engineering**
- **Medical**
  - Devices
  - Disease: Central Nervous System
- **Nanotechnology**
  - Electronics

RELATED CASES

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