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Reference Number: 025418/0010

Title of the Invention

POWER MANAGEMENT TECHNIQUES FOR IMPLANTED STIMULATORS

Invention

Power management methods, systems and circuitry are provided for efficiently energizing implanted stimulators. Efficiency is achieved by automatically adjusting the power- supply voltage of the stimulator channel so that the magnitude of the voltage of the current- sink or current-source providing the stimulation current is regulated within a narrow band just above the minimum acceptable level. Adjustment is done once in every cycle of the external high-frequency power source in order to achieve regulation with a very fine time resolution throughout each stimulation period. The power supply voltage is generated and adjusted by rectifying the high-frequency voltage of the secondary coil of a transcutaneous magnetic link by closing and opening a solid-state switch at appropriate times during positive half cycles for a current-sink, and during negative half-cycles for a current-source. The timing of switch closure and opening is dictated by a logic controller on the basis of two binary signals generated by two separate comparators, one of which comparing the voltage of the secondary coil with the generated power-supply voltage, and the other comparing the current-sink or current-source voltage with a reference voltage.

Advantages

This patent describes a technique that minimizes current source energy loss in embedded stimulator microchips, such as cochlear implants in bionic ears, whose energy is supplied inductively from outside the body, thus prolonging battery charging time. Its prototype-manufactured and test-verified performance is described in the following article. [U. Çilingiroğlu, S. İpek, "A zero-voltage switching technique for minimizing the current-source power of implanted stimulators," IEEE Transactions on Biomedical Circuits and Systems, vol. 7, p. 469-479, 2013.]

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Current Status

GERMANY, USA, UK, FRANCE, BELGIUM, SWEDEN, SWITZERLAND, ITALY, SPAIN, AUSTRIA, POLAND, NETHERLANDS, AVUSTRALIA: Registered

Keywords

Functional electrical stimulation, Implanted stimulator, Zero-voltage switching, Power efficiency. , Bionic ear, severe to profound hearing loss, medical device

TRL: 8

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