

Electric Energy Generation from Nuclear Decay for Powering Small Devices

Technology #15111

Applications

Nuclear decay used to generate power in the following proposed configuration can be used in a range of autonomous electrical and electromechanical devices. These devices would be particularly well suited for downhole environments.

Problem Addressed

Many autonomous electrical and electromechanical devices require long-life high-density sources of electrical energy, which cannot always be met by current battery technologies as they would have to be recharged for the desired lifetimes. This device is a long-life high-density source of electrical energy that is extracted from nuclear decay that produces charged particles. In the preferential configuration, this device uses Ni 63, which has a specific power near 2.4 mW/g, an optimal collection voltage of 17kV, and a half-life of 101 years.

Technology

This device consists of a decaying isotope that emits kinetically-energetic charged particles placed on one side of a capacitor. The kinetic energy of the particles carries them to the opposing side of the capacitor where they are collected, thereby charging the capacitor. The process continues until the potential energy across the charged capacitor gap matches the kinetic energy of the emitted particles. As the capacitor is discharged, its voltage decreases, and charging resumes until the isotope has fully decayed. The preferential configuration uses Ni 63 as the isotope; however, Ca 45 can also be used, which has a specific power near 2.9 W/g, an optimal collection voltage of 65 kV, and a half-life of only 163 days. Ni 63 is preferred because it is only a beta emitter, it decays into a stable atom, and the beta particles have relatively low energy that minimizes secondary x-ray emission.

Advantages

- Long-life high-density source of electrical power
- Can be used for power generation in downhole environments

Categories For This Invention:

Energy

Electromechanical Systems

Hydrocarbons

Oil Exploration

Nuclear Power

Intellectual Property:

Procedure and Device for Electric Energy Generation from Nuclear Decay for Powering Small Devices in Downhole Environments

Issued US Patent

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