

## Non-Confidential Description - PSU No. 3862 "Capacitor Circuit to Reduce Voltage Reversal"

### Keywords:

Capacitors, microbial fuel cell, wastewater, voltage reversal, array, batteries, electricity

### Links:

[Inventor Website](#)

[Published Patent Application](#)

### Inventors:

Bruce Logan, Younggy Kim

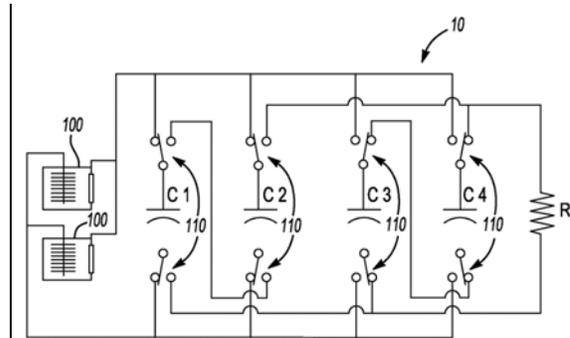


Fig 1: Capacitor Circuit Diagram

### Background

In-series application of reaction-based energy systems can be limited by voltage reversal. Voltage reversal occurs when multiple batteries are arranged in series and one battery malfunctions, due to reduced power capability, while the other batteries actively provide electric potentials. This voltage reversal not only prevents stable operation of the multiple battery system, but it can also damage electrode systems of the malfunctioning battery. If electrode reactions are driven biologically by microorganisms, an in-series system can be sensitively affected by voltage reversals in microbial fuel cells (MFCs). While MFCs can be used to convert organic contaminants in wastewater into electric energy, the low voltage problems have been one of the limiting factors for practical applications in a large scale wastewater treatment plant.

### Invention Description

The invention provides a new method to stably capture energy at high voltages from multiple power sources, such as an array of MFCs, without voltage reversal problems. Voltages can be effectively combined from multiple power sources without voltage reversal by using an electronic circuit built with capacitors. The system works by one or more power sources charging one or more capacitors in parallel. The capacitors are then discharged in series, achieving an increase in voltage in proportion to the number of capacitors charged and their individual voltages. This method has potential in multiple types of microbial fuel cell systems and more broadly in medical devices including pacemakers, defibrillators, nerve stimulators, and many others.

### Advantages/Applications

- Reduces voltage reversal problems
- Application in energy and medical fields
- Utilizes electronic circuit built with capacitors