Nanowire Piezo-Electric Generator (#3702, 3712, 3713, 3716, 3817, 4892)

An innovative approach for converting nano-scale mechanical energy into electric energy using piezoelectric ZnO nanowire arrays

Georgia Tech inventors have developed an innovative approach for converting nano-scale mechanical energy into electric energy using piezoelectric ZnO nanowire arrays. By deflecting the aligned NWs using a conductive AFM tip in contact mode, the energy that was first created by the deflection force and later converted into piezo-electric energy has been measured. By simultaneously acquiring the topography and voltage output images, the piezoelectric discharge process has been investigated as a nano-scale power generator. This is an approach that converts chemical energy to mechanical energy. This principle and technology has the potential of converting mechanical movement energy (such as body movement and blood pressure), vibration energy (such as acoustic and ultrasonic waves), and hydraulic energy (such as blood flow and contraction of blood vessels) into electric energy that may be sufficient for self-powering nanodevices and nanosystems. The nano-generator could be the foundation for exploring new self-powering technology for in-situ, real-time, and implantable biosensing, biomedical monitoring, and biodetection.

Benefits/Advantages

- **Informational** —provides insight into implantable bio-nanotechnology
- **Flexible** — replaces ceramic piezoelectric components with readily deformable substrates
- **Self-powering** — eliminates dependence on external power sources
- **Compact** — may be used in both in vitro and in vivo applications

Potential Commercial Applications

- Nanodevices and nanosystems
- Implantable bio-sensing
- Biomedical monitoring
- Biodetection
- Printable Electronics
- Resonators

Background/Context for This Invention

Developing technologies for wireless nanodevices and nanosystems are of critical importance for in-situ, real time and implantable biosensing, biomedical monitoring, and biodetection. An implanted wireless biosensor requires a power source, which may be provided directly or indirectly by charging of a battery. It is highly desirable for wireless devices and even required for implanted biomedical devices to be self-

powered without using battery. Therefore, it is essential to explore innovative nanotechnologies for converting mechanical energy (such as body movement, muscle stretching), vibrating energy, and hydraulic energy into electric energy that will be used to power nanodevices without using battery.

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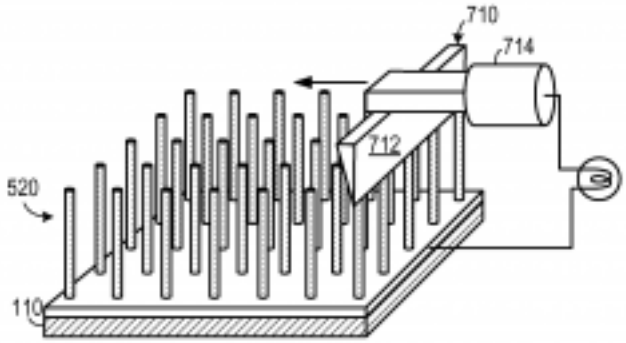

FIG. 7

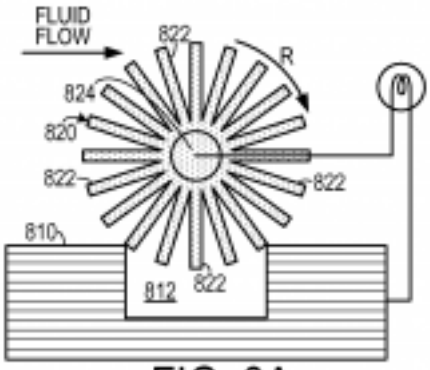

FIG. 8A

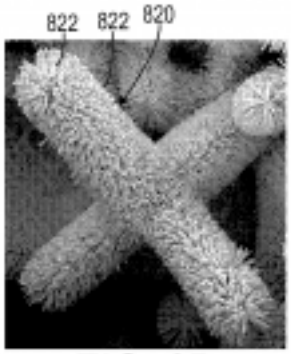

FIG. 8B

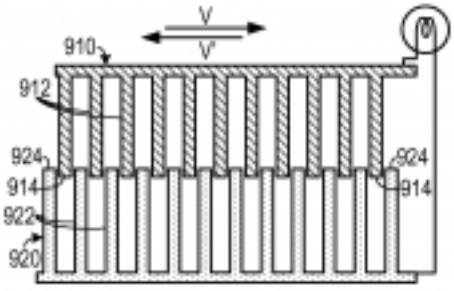

FIG. 9A

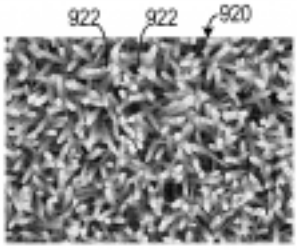

FIG. 9B

For more information about this technology, please visit:
https://industry.gatech.edu/technology/nanowire-piezo-electric-generator