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Enhanced Catalysts & Apparatus for Heat Generation, Internal Combustion Engines, and Thermoelectric Power

As electronic devices become increasingly complex and widespread, so does the demand for portable electric power generation. Portable electronic devices powered by traditional batteries are limited by their short lifetime, energy capacity, and relatively limited accessibility. Portable generators run on hydrocarbon fuels including kerosene and diesel, overcome the limitations of batteries, but their engine-based design results in noise pollution and recurring maintenance. An alternative to expensive and fuel-type limited fuel cells, thermoelectric generators can produce power from any heat source—translating to extended lifetime, high energy capacity, widely accessible, noiseless, durable power production.

Advantages

This technology combines the high efficiency of matrix-stabilized porous-medium combustors, which conserve more heat than conventional open-flame alternatives, with a catalyst enhancement to improve temperature conditions for more efficient combustion. The new catalyst-coated porous media enables combustion of lean mixtures—fuels with a high percentage of air and a low percentage of fuel, allowing for fuel flexibility. Inexpensive fuels can be burned more efficiently than what is possible with currently available combustion technologies. This catalytic porous media provides more energy per volume of fuel possible while generating fewer harmful emissions.

Technical Details

The invention improves thermoelectric power generation in multiple ways, by providing for combustion in the lean burn condition, extracting more heat than existing technologies, and allowing for combustion of fuels that would otherwise not be useable. In the looped-configuration combustion apparatus, to achieve high efficiency, the intake air and fuel is pre-heated by an integrated heat exchanger using exhaust products, and the heat is extracted to the thermoelectric generator using the thermal conduction of the porous media. To burn alternative fuels, a novel fuel vaporization metallic porous foam was created to uniformly and efficiently distribute it within the combustion loop apparatus. A subsequent mixing chamber incorporates the air fuel mixture to improve the fuel's combustibility, which occurs in the proceeding catalytic porous media.

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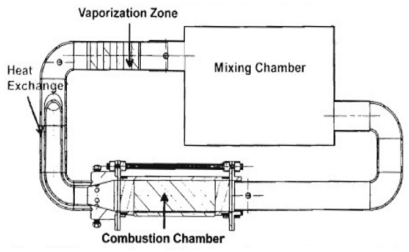

Schematic of a burner. Note the four primary zones of importance: heat exchanger, vaporization zone, mixing chamber, combustion chamer.

Benefits

- More efficient combustion
- Fuel flexibility: Power from lean mixtures
- Smaller equipment requirements
- Little-to-no maintenance
- No complicated control system needed
- Less environmental contamination, when burning low-calorific fuels

Applications

- Internal combustion engines: water heaters, gas stoves, boilers, portable generators
- Portable thermoelectric power generators: for camping, military use, natural disaster aid

Tech Field

Clean Technologies

Keywords

thermoelectric power generation, portable, internal combustion engine, porous media, ceramic matrix, natural gas, perovskite catalyst, lean fuel mixtures

Patent Pending

If you or your company are interested in this opportunity, Contact:

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