ENERGY UNLIMITED, INC.

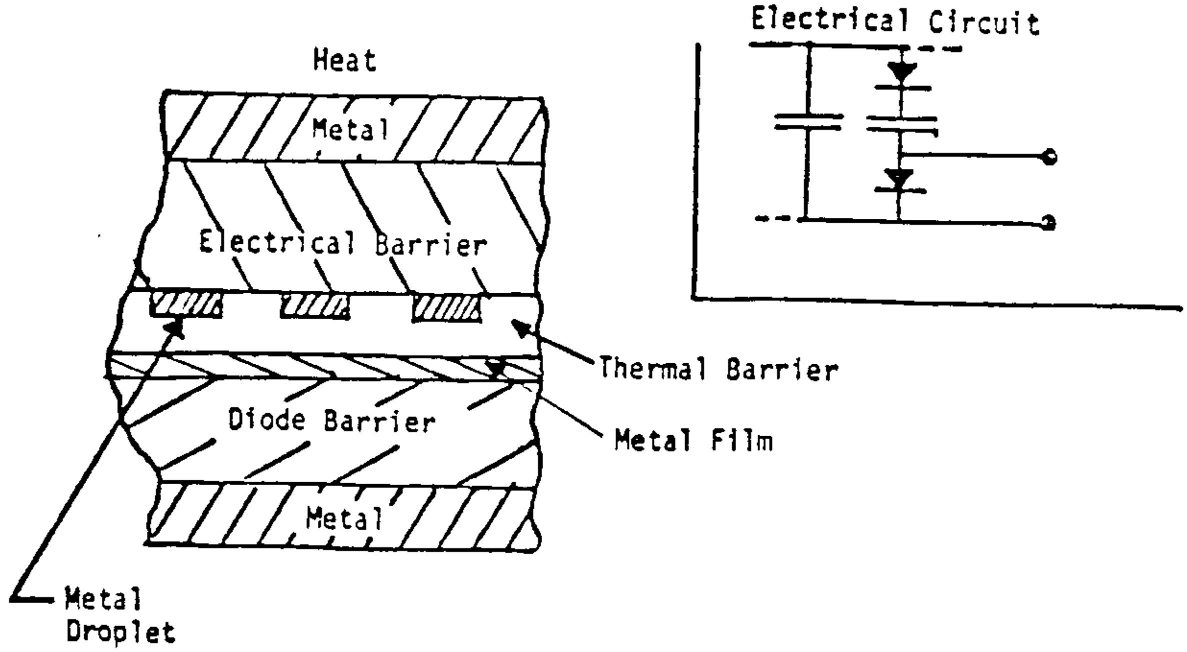
AUTUMN LANE • LINCOLN, MASSACHUSETTS 01773
(617) 259-8544

Reversible Energy Fluctuation Converter

The invention, a Reversible Energy Fluctuation (REF) converter enables heat incoming by radiation, conduction or convection over a wide temperature range to be converted at a high efficiency and for a low material cost into useful output power. Alternatively, the REF converter can be operated with an input power to pump heat from a lower temperature region to a higher temperature region with a high coefficient of performance.

The REF converter first absorbs and converts the incoming heat in any form into electric energy fluctuations in a heated layer. The electric energy fluctuations are the result of the random motion of electric charges in the heated layer. It is important to understand that the available power from these electric energy fluctuations is very large. For example, the available electric fluctuation power from a layer only one millionth of a centimeter thick can be much larger than 100 million watts per square meter or larger than required for any present application. These electric energy fluctuations are coupled across a thermal barrier from the heated layer to a layer of cold rectifying diodes on the opposite side of the thermal barrier. A power output is then obtained from the resultant rectified current.

For different applications ranging from terrestial home and commercial solar energy power conversion; space solar energy power conversion; home and commercial heat pumping, air conditioning, and refrigeration; and fossil fuel power conversion, including topping and tailing of existing systems, different design options have been analyzed. A design option similar in part to conventional solar cell designs is shown in the drawing. In this design the incoming heat is absorbed in the metal film and metal droplets on the hot side of the thermal barrier. The electric energy fluctuations results in a fluctuating voltage on the metal droplet. This voltage, in turn, results in an electric field across the thermal barrier to the adjacent region of the diode barrier. The rectified current resulting from the electric field across the barrier of the cold rectifying diode results in a direct current output between the metal terminal on the bottom of the diode barrier and the collecting metal film on the top of the diode barrier. For this design as well as the other designs, the heat pump mode is implemented by a direct current power input to the cooled layer to transfer the energy fluctuations from the cold side to the hot side.



All design options including planar and non-planar, thin film and discrete component models for this invention have as integral components the heated first layer and the thermal barrier which makes possible four advantages over solar cells to be realized. These advantages are maximum efficiency with efficiencies of over 80% for high power solar energy conversion; maximum power output with available power tens of thousand times larger than can be transferred by radiation to solar cells; minimum material requirements of the order of one hundredth of the barrier material for solar cells; the widest operating temperature range for many reversible applications down to the cryogenic temperature range and up to the incandescent temperature range.

These four advantages are the direct and interrelated physical result of the addition of the heated first layer and the thermal barrier which together first convert the heat to electric energy fluctuations and then transfer this energy in the near field to rectifying diodes. These two additional layers, then enable the voltage levels of the input energy to be efficiently controlled and to be at a high power level which together result in the foregoing advantages for the REF converter.

In addition to the foregoing reported work, theoretical analysis for idealized REF models involving interacting particles have been obtained and are to be published that give results that indicate the performance of these REF models may be increased to higher limits than that given by the Carnot cycle. These theoretical results must be confirmed by experiments before the practical results can be assessed since present physical knowledge does not enable a definitive analysis or prediction to be made of practical REF circuits involving interacting particles. Nevertheless, the possible gain in performance if the practical implementation of these idealized REF models involving interacting particles can be realized cannot be ignored. If we are fortunate and the results of the planned experiments do confirm the predictions of the theory of these idealized REF models for interacting particles for a practical model, then the energy crisis of the world will be eliminated almost over night.

These experiments will then confirm that the interacting particle REF models are able to achieve a 100% power conversion efficiency for any temperature and for any temperature difference and are able to achieve a power conversion output from input heat to the cold side of the thermal barrier of the REF converter. These capabilities will make it possible to achieve energy independence without requiring energy storage for any home or building or for cars or airplanes. The potential will also exist for the long term to control the weather and reclaim the deserts.

While it is important to note that this potential performance is based on an idealized interacting particle REF model and that this potential performance cannot be confirmed until the results of the planned experiments are obtained, it is also important to note that the high potential performance of the independent particle REF model to approach the Carnot cycle efficiency is in no way dependent on the results of the experiments on the interacting particle REF model.

References

1. J.C. Yater, Phys. Rev. A 10, 1361 (1974).
2. J.C. Yater, in Proceedings of the Second International Conference on Thermoelectric Energy Conversion, Arlington, Texas, 1978, edited by K.R. Rao (IEEE, New York, 1978).
3. J.C. Yater, Phys. Rev. A 20, 623 (1979).
4. J.C. Yater, "Relation of second law of thermodynamics to the power conversion of energy fluctuations" (to be published in Phys. Rev. A in Oct. 1979).