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Hybrid Piezo Portable Shelter

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Abstract

Escalating demand for electricity has led to a shortage, especially due to the depleting fossil fuels. On the contrary, the rural areas of developing nations are not fully electrified. This gave way to research and implementation of renewable and distributed power generation. This paper presents a possible solution to economically overcome the energy deficit. A hybrid piezo electric portable shelter is proposed to be designed with solar panels and piezo electric sensors. The system comprises a piezo-electric mat, solar panels and an efficient controller. The control logic is developed aiming at maximizing the efficiency and utilization of each source. The proposed system design can be used to develop the shelter with commercially available solar panels and efficient piezo mats. The shed can be used to charge devices through USB ports and for lighting systems.

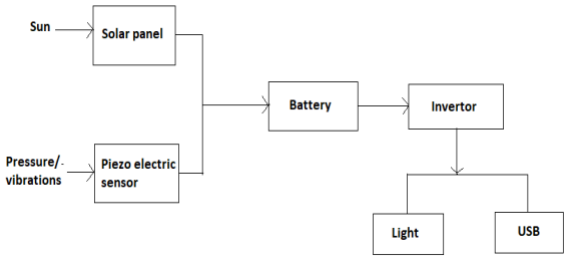
Keywords

Solar PV, Piezo-electricity, hybrid portable shed, controller.

Introduction

Normally a human body carries a huge amount of energy which simply gets wasted in our regular day to day work. Moreover the largest amount of energy that is simply wasted is while walking. In this, we will see how our walking process can be utilized for generating electricity using piezo devices. With the help of solar panel we will be able to produce solar energy .This combination of piezo devices and solar panel results in production of increased quantity of energy.

Block diagram

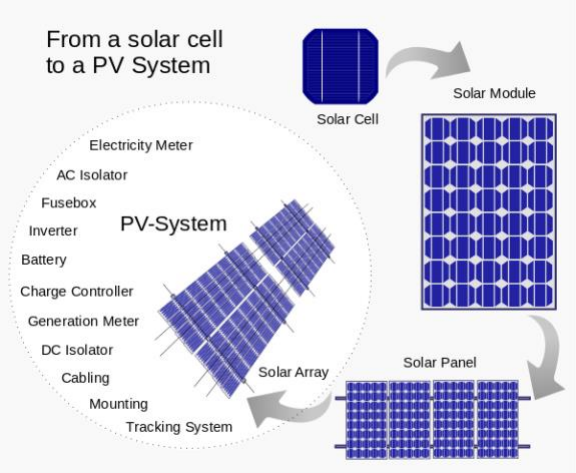


Solar panel comprises of smaller units called photovoltaic cells which convert sunlight into electricity. The piezo electric sensors use the piezo electric effect by converting changes in pressure into an electrical charge. The electric charge produced will be stored in the battery. All the backups power solutions, inverters function by converting the dc current into ac current as it runs on the ac power. This power will be given to lights and USB.

Solar panel

Solar panel is fundamental element for this device. Solar panel is actually collection of solar cells. By the effect of photovoltaic they generates electricity. Solar panel consists of grid line pattern in which solar cells are arranged in frame that is either rectangular or square. They are also called photovoltaic module. Solar panel comprises of smaller units called photovoltaic cells which convert sunlight into electricity. Once the cells absorbs the light energy from the sun it generates electricity and is stored in battery. Solar cells must be protected from mechanical damage and moisture.

To acquire desired voltage the cells are connected in series ,the cells are connected in parallel in order to acquire desired current .These panels are very hardy and is made up of crystal silicon solar cells. Solar panels are pollution free and thus reduce global warming. Let's contribute in saving the environment . These days solar panels has wide applications.

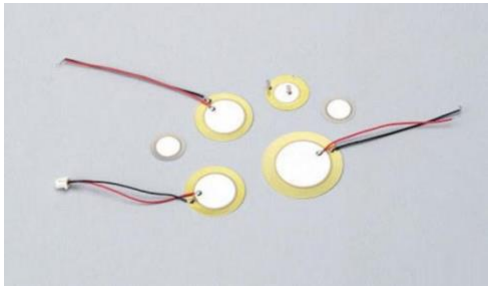


Lithium battery

This is the storage component for this device .This is rechargeable battery. Lithium battery are used for portable electronics. Positive electrode and negative electrode comprises of intercalated lithium compound and graphite respectively. It has low self discharge and high energy density. Typical estimated life of lithium ion battery is three years. Moreover ,lithium ion battery is inexpensive.

Piezo electric sensor

This is a major source for this device. It is a device which converts the change in pressure or vibration or mechanical stress to an electric charge. The piezo electric sensors works under the principle of piezo electric effect. Piezoelectric effect is an effect due to strain caused by a stress on a piezoelectric material, thus causing polarization of electric charges on the surface of the piezo-material. A mechanical stress or strain on a piezoelectric material cause electric potential to develop between two points on the surface of a piezoelectric material. The electric charge is proportional to the force, and hence when under compression, the charge moves into a particular direction and under tension, the charge moves in opposite direction.The stress or strain can come different sources such as human motion, automobiles, operating equipment, drilling, earth-quakes, tidal waves, wind power etc



Inverter

Inverter is a device which changes direct current into alternative current. Inverter is a compact and rectangular shaped electrical equipment. The inverter may be built standalone equipment for application such as solar power.

Aluminum rod

Aluminum rod is circular in shape where bar aluminum can have any number of sides .Aluminum is about one-third the weight of steel .It has various applications such as rust proof, water proof, corrosion-resistant.

USB port

USB stands for Universal Serial Bus. USB ports allows USB devices to be connected with each other and transfers digital data over USB cables .We may plug cables into a USB port at any time regardless of whether the devices are powered on or off.

LED Light

A light-emitting diode (LED) is a semiconductor light source that emits light when current flows through it. Electrons in the semiconductor recombine with electron holes ,releasing energy in form of photons. White light is obtained by using multiple semiconductors or a layer of light-emitting phosphor on the semiconductor device.

Result

Thus by building the " Hybrid Piezo Portable Shelter " ,we will be able to produce a quantity of certain electrical energy .This electrical energy will be utilized for the usage of USB port and LED light which is our ultimate aim.

Conclusion

Thus by following these steps we can built this "Hybrid Piezo Electric Sensor". Since, the idea of our project is own ,we will be able to gain a lot of theoretical and practical knowledge by building this project. We guarantee that this project will be handy and effectively used by consumers.

Reference

[1] Meyers, Glenn (31 December 2014). "Photo-voltaic Dreaming 1875--1905: First Attempts At Commercializing PV". cleantechnica.com. Sustainable Enterprises Media Inc. CleanTechnica. Retrieved 7 September 2018.

[2] Christian, M. "The history of the invention of the solar panel summary". Engergymatters.com. Energy-matters.com. Retrieved 25 January 2019.

[3] Battery Types and Characteristics for HEV Archived 20 May 2015 at the Way back Machine Thermo Analytics, Inc., 2007. Retrieved 11 June 2010.

[4] Mauger, A; Julien, C.M. (28 June 2017). "Critical review on lithium-ion batteries: are they safe? Sustainable?" (PDF). Ionics. 23 (8): 1933–1947. doi:10.1007/s11581-017-2177-8. S2CID 103350576.

[5] Gautschi, G. (2002). Piezoelectric sensorics. Springer Berlin, Heidelberg, New York. p. 3. ISBN 9783540422594 – via Google Books.
[6] Inverter Battery Capacity Calculator & Easy To Follow Formula". InverterBatteries.in. 2020-03-15. Retrieved 2020-07-22.
[7] Taylor-Moon, Jonathan (2013). "Alabama Engineering University, Inverters, Prof.Dr.Eng. Jonathan Taylor - Moon | Power Inverter | Photo-voltaic System". Scribd. 7 (Converter and inverter technologies).
[8] Shakhashiri, B.Z. (17 March 2008). "Chemical of the Week: Aluminum" (PDF). SciFun.org. University of Wisconsin. Archived from the original (PDF) on 9 May 2012. Retrieved 4 March 2012.
[9] Janssen, Cory. "What is a Universal Serial Bus (USB)?". Techopedia. Archived from the original on 3 January 2014. Retrieved 12 February 2014.
[10] Portable Garages – When On Earth Media". When On Earth. 2019-10-26. Retrieved 2019-12-09.
[11] Energy and the challenge of sustainability" (PDF). United Nations Development Programme and World Energy Council. September 2000. Retrieved 17 January 2017.