



Electrical Energy Production from Footsteps

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ABSTRACT: This paper deals with the generation of electricity from footsteps which can be obtained while walking or running on certain arrangements like foot paths, stairs, platforms and this system can be installed anywhere. When a person walks, he losses energy to the ground in the form of impact, vibrations etc. This energy can be tapped by piezoelectric crystals and can be converted to a usable electrical form. This electrical energy can be stored in a battery for later use. A prototype of the system is built along with rack and pinion arrangement for meeting the load requirement. Here the paper explains the prototype development of the system and the hardware result was obtained.

KEYWORDS: renewable energy, piezoelectric effect, rack and pinion arrangement.

I. INTRODUCTION

Man has needed and used energy at an increasing rate for his sustenance and well-being ever since he came on the earth a few million years ago. Nowadays the increasing demand for energy necessitates the use of renewable sources. The objective of this work is power generation using footsteps as a source of renewable energy which can be obtained while walking on certain arrangements like footpaths, stairs, platforms and these systems can be installed anywhere especially in densely populated areas^[1].

Walking is the most common activity in day to day life. When a person walks, he loses energy to the road surface in the form of impact, vibration, sound etc., due to the transfer of his weight on to the road surface, as foot falls on the ground during every step^[5]. This energy can be tapped and converted to a usable form such as in electrical power and can be stored for later use. In order to develop a technique to generate the energy from foot step, piezoelectric system is used in this seminar. This can convert foot impact energy into electrical energy^{[2][3][4]}.

Section II deals with Working principle of the Electrical Energy Production From Footsteps.

Section III deals with Main components of the system.

Section IV deals describes the hardware implementation and result obtain.

Section V concludes the paper.

II. WORKING PRINCIPLE

The working principle of the Electrical Energy Production From Footsteps is as follows: When pedestrian steps on the top plate of the system, the plate will dip down slightly due to the weight of the pedestrian. The downward movement of the plate results in generation of electrical power. The top plate reverts back to its original position due to negating springs provided in the device. Such devices are embedded in places where there is continuous human traffic such as in shopping malls, railway platforms etc. A battery is connected to the system which stores this energy for future use. In the project a LED display is being run using this foot power.

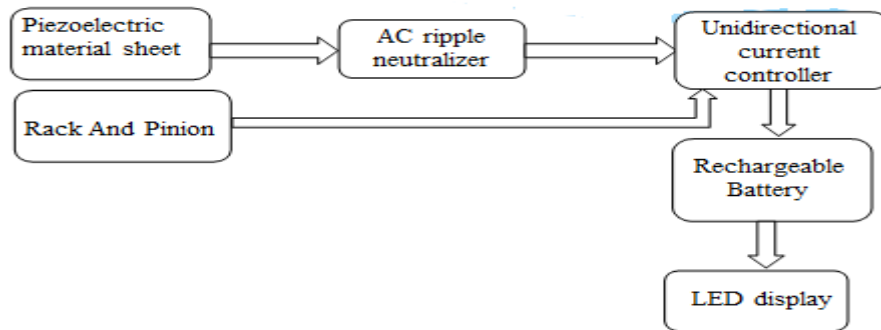


Fig.1 Block diagram

II.MAIN COMPONENTS OF THE SYSTEM

(A). PIEZOELECTRIC CRYSTALS

One of the most suitable methods for obtaining the energy surrounding a system is achieved by using piezoelectric crystals. Piezoelectric crystals are one of small scale energy sources. The piezoelectric crystals are subjected to vibration they generate a very small voltage and the phenomenon is called piezoelectricity. It has a crystalline structure that converts an applied vibration into an electrical energy. The piezoelectric effect exists in two properties: The first is the direct piezoelectric effect that describes the material's ability to transform mechanical strain into electrical charge. The second form is the converse effect, which is the ability to convert an applied electrical potential into mechanical strain energy. These properties allow the material to function as a power harvesting medium.

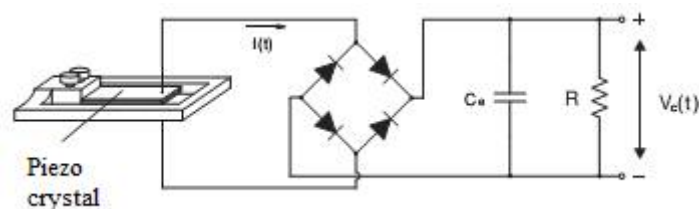


Fig.2 Energy harvesting from piezoelectric crystal.

Due to the vibrations, piezoelectric crystals generate the electrical power. The produced output voltage is in the form of AC. Then it can be converted to DC by passing it through Rectifier circuit. The converted DC voltage can be fed into Voltage regulator.

(B). RACK AND PINION ARRANGEMENT

Rack and Pinion is an electro-mechanical energy generating machine. This machine converts reciprocating motion in to rotary motion. The rotational power is stored in gear arrangement rotates dynamo, which generates electricity.

III.HARDWARE IMPLEMENTATION

The prototype model of the system was used to charge a lead acid battery. The output of the system was illustrated fig.4



Fig 3. Hardware Implementation

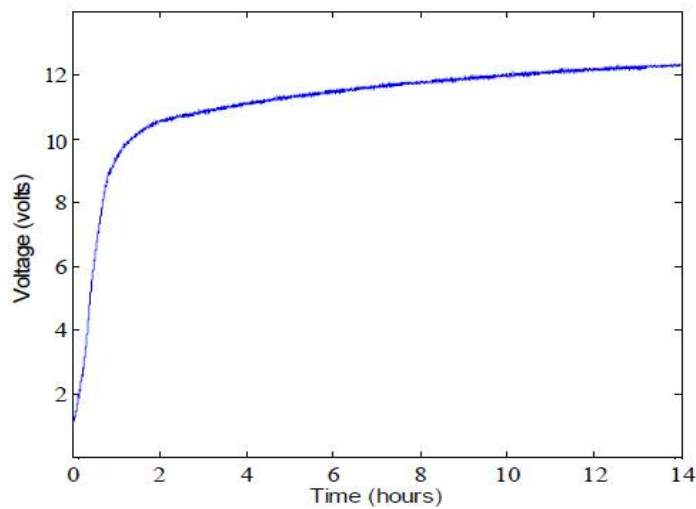


Fig 4. Battery (4.5Ah) charged by PZT and Rack and Pinion Arrangement



IV.CONCLUSION

The objective of this paper is to harvest the energy from footsteps. By continuous stress on the crystal and the rack and pinion arrangement the voltage and current developed is enough to charge a lead acid battery. The rechargeable battery charged can be used later, and can be converted into ac as per the load requirement. As a future work the system can be implemented in play grounds or in roads where frequent human or vehicles interaction occurs.

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