

Power Walker

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Abstract— This research paper presents power generation by using piezoelectric transducer with pressure mechanism support. It is important to look for other energy sources because of the rapid depletion of the main fossil energy source. The generation of power from human footsteps is a sustainable and green source of energy. This research work is aimed at developing and testing a simple device that transforms human footsteps ' kinetic energy into electrical energy. In this experiment, a round shape of the piezoelectric transducer with size of 35 mm in diameter is used which take foot pressure in the form of kinetic energy and convert it into electrical energy.

Keywords— *piezoelectric transducer, foot pressure, kinetic energy, electric energy.*

I. INTRODUCTION

Industrial development has resulted in increased wealth for many people around the world, but has also led to a loss of natural resources and environmental damage. The impact on worldwide system ensuring from temperature change successively expected to guide to substantial economic losses. The consumption of fossil fuels, on that industrial development has been mostly primarily based, has been recognized as a serious reason behind temperature change. ^[1] Alternative energy sources generally outline as energy sources that do not cause or limit net emission of greenhouse emission, and so for the most part avoid the environmental impacts associated with the consumption of fossil fuels. New and renewable sources of energy embrace solar energy, wind energy, bio energy, heat energy, wave and periodic event power. The electricity produced from this device can be generated without giving negative impacts on the

environment and the produced renewable energy does not depending or relying on climate or weather condition. The transducer used in this device is piezoelectric transducer that detects vibration or pressure from footsteps to generate electricity. ^[2] This device can be employed in all crowded spots with a big variety of pedestrians like airport, mosques, churches, underground stations, theatres, shopping malls etc. This method of energy gathering is appropriate for applications like LED displays, traffic signals, street lighting, advertising and billboards.

II. LITERATURE REVIEW

The urges of producing new or renewable energy is very recent concept. The researching area regarding this was limited but its unavoidable impact in climate change creating interest among the researchers to work more in this sector.

In a paper named “Utilization of Human Footsteps for Power Generation” researched to demonstrate the feasibility of using NG (Nano-generator) to harvest huge-range of mechanical energy, from footsteps, rolling wheels, wind power, and ocean waves. This paper examined three different devices that can be built into a shoe which can be used to generate electric power. ^[1] In another paper named “Power generation by using piezoelectric transducer with bending mechanism support” presents about power generation by using piezoelectric transducer with bending mechanism support which is developed by employing 3D printer technology. They placed piezoelectric transducer on the 3D model with 0 mm in diameter of middle hole will producing 5.4 V voltage output. ^[2] The main theme of the paper named “Power Generation from Piezoelectric Footstep

Technique” was the production of electric power from the foot step movement of the peoples and the pressure exerted during walking which is fritter away.^[3]

III. WORKING MECHANISM

A. System Architecture

The piezoelectric transducer depends entirely on the crystalline structure. The piezoelectric transducer is made up of both positive and negative charges. Therefore, the strength of the polarization can be measured when the force or stress is applied. In normal conditions or without stress or strain, the piezoelectric transducer will remain neutral as there is no potential difference when negative and positive charges are balanced for both sides.^[4] Two main categories of piezoelectric effect are the direct piezoelectric effect and the converse piezoelectric effect. The simple piezoelectric effect to demonstrate the power of transforming mechanical energy into electrical energy is also known as the generator or transducer effect. The converse piezoelectric effect, on the other hand, is the inverse capacity of the direct piezoelectric effect which it transforms into mechanical energy. This converses piezoelectric effect also known as the effect of the motor or actuator. The piezoelectric transducer transforms the kinetic power from the pressure applied to it to produce electrical energy by using the piezoelectric effect.^{[5],[6]}

The setup is designed in a way that the piezo disc shares a common load (here it's an LED bulb). The concept of Power Walker is to generate and store electricity from footsteps. In our prototype we designed the footpath in a way that the piezo disc should be embedded inside the pavement. Whenever someone crosses the platform, a charge is generated. The initial idea was to conserve the power in a battery so that it can be used for later. We wanted to utilize a booster converter to step up our current but the minimal threshold of the booster converter being 3V. We couldn't generate enough electricity to lit a bulb through the booster converter.

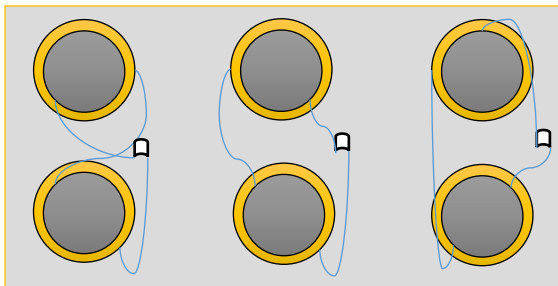


Fig1. Block Diagram of Working Mechanism

B. Experiment and Result Analysis

The piezoelectric transducer gives output in an DC waveform. Here we used six piezoelectric transducers in series and which produce current from foot pressure and the current is stored in a capacitor to light bulb. From six piezoelectric element we produce approximately 3.3 V voltage which include almost six footsteps. The output voltage and power are directly proportional to the pressure applied or in other words the weight of the person walking on it and the time the person is standing on it.^[7] With the increase in piezoelectric elements the amount of current produce will also increase.

TABLE 1: ENERGY STORAGE BY FOOT STEPS

No of foot steps	Total Voltage (V)	Total Current(A)	Total Energy (W)	Energy/steps (W)
60	33	165	544.5	9.07
120	66	330	1089	9.07
240	132	660	2178	9.07
300	165	825	2722.5	9.07

Fig2. Energy Storgae Table

IV. CONCLUSION

This paper has presented power generation by using piezoelectric transducer with pressure mechanism support. The devices characterized by its straight forward style and simple construction. One or fewer devices could manufacture enough power for light or electronic appliances and a huge variety of devices may produce enough power for the general public electricity grid. The device is much helpful for its comparatively significant impact in producing green and renewable energy. The main source of power generation of this research is footsteps. This device does not use any conventional energy source and have no adverse effect to the environment because of its zero percent emission mechanism. If this plan is enabled, it will not only contribute to and solve energy shortage issues, but will also lead to sound global environmental change.

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