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Review IJICEGT

Electrical Power Generation from Foot Step using 555 Timer IC

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Abstract

Electricity has now become a basic requirement for all humans. Electricity is used in almost every situation. Without electricity, we would perish. Electricity is employed in everyday life, industries, and transportation, among other things. So, by merely walking on the footstep, we are creating electrical power using renewable energy. Because non-renewable energy is scarce, renewable energy is in high demand these days. This paper discusses the process of generating mechanical energy from human footsteps and transferring it to electrical energy using a piezoelectric transducer. This type of generation falls under the Energy scavenging category of renewable resources, and it involves capturing and converting waste energy produced by routine activities, such as heat produced by exothermic reactions. There is a need to find alternative energy sources when the availability of traditional energy decreases. Almost all of our country's state electricity bureaus are unable to supply power in accordance with demand. The energy provided by these enterprises is insufficient even for residential utilities; in such a dire situation, diverting energy for other public requirements is extremely challenging.

Keywords: Electrical power generation, Footsteps, 555 Timer IC, footstep power generation system, Multilevel Inverter.

INTRODUCTION

Electricity has now become a basic requirement for all humans. Electricity is used in almost every situation. Without electricity, we would perish. Electricity is employed in everyday life, industries, and transportation, among other things. Engineers are now devising new ways to generate electricity in order to meet the rising demand. There are numerous locations in the world where power is unavailable. As a result, we are generating electrical power using renewable energy by merely walking on our toes. Because non-renewable energy is scarce, renewable energy is in high demand these days. There is a need to find alternative energy sources when the availability of traditional energy decreases. Almost all of our country's state electricity bureaus are unable to supply power in accordance with demand. The energy provided by these enterprises is insufficient even for residential utilities; in such a dire situation, diverting energy for other public requirements is extremely challenging. Every small appliance used by the new generation requires electricity [1–5]. Many energies are being wasted and expended, such as human bioenergy, therefore we can make it feasible to utilize that energy to create a fantastic creation. As a result, a different source must be found. We're going to employ renewable energy by transforming mechanical energy into electrical energy with our feet. It's clean, safe, and free, and it doesn't contaminate the environment, so it'll be a very viable option in the future. The footstep mechanism provides nonstop energy, which can be stored and used to energize the

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lamps, as our population grows day by day. The idea is to transform mechanical energy into electrical energy in this case. Proposal for utilizing waste energy from human mobility is quite relevant and vital in densely populated areas.

MECHANISM

Working Principle

The stride control era's final graph is shown below. Only one stride is tilted in a specific direction, which is used to generate power. The right driving course of action converts the pushing energy into electrical vitality. At the slanted stride, the rack and pinion, spring course of action is settled. By discharging the heap, the spring is used to return the tilted stride to its original position. As seen in Figure 1, the pinion shaft is connected to the supporter by an end course. The larger sprocket is also connected to the pinion shaft, allowing it to run at the same speed as the pinion. With the help of chain, the larger sprocket is connected to the smaller cycle sprocket (cycle). The revolution drive is transferred to the smaller sprocket via this larger sprocket. For the forward and turn around headings of rotational development of the main sprocket, the smaller sprocket runs on the same bearing. This activity becomes locked, as if it were a cycle. The smaller sprocket shaft is also connected to the fly haggle wheel [6–8].

Thermodynamic Rule

"Energy is neither generated nor destroyed; it can only be converted from one form to another," according to the first rule of thermodynamics. As a result, we're transforming solar energy to electricity.

Construction of footstep power generation system

Stationary plate: It is a base plate that is connected to other rigid RCC steps and provides a functioning stage for the moving force venture via a bearing backing method.

Control Step: It is a rectangular Cast Iron plate supported by two deep score metal balls and a fixed plate.

Open Coil Helical Spring: The heap is carried on the edge of the power step by two pressure springs. The proceeds with wavering of the power step are also accommodated by springs.

Interfacing Rod: It connects the power step to the wrench shaft. It communicates the power venture's direct movement to the wrench.

Wrench Shaft: A metal roller supports and settles one end of the wrench shaft. The flywheel is connected to another end.

Fly Wheel: The flywheel's circuit is designed as a pulley system to control the belt drive that connects the flywheel and generator.

Belt Drive: It connects the flywheel to the generator shaft. It transfers power from the flywheel to a little pulley shaft (generator shaft).

INVERTER

Because the battery's power is in DC mode and the motor that drives the wheels uses air conditioning power for the most part, a power converter is required to convert DC to air conditioning power. This transformation is possible with inverters. The two-level inverter, which consists of four switches, is the simplest topology that may be used for this modification. Every switch requires an anti-parallel diode, thus there should be four hostiles to parallel diodes in total. Inverters come in a variety of topologies as well. A multilayer inverter is a power circuit structure that combines a sinusoidal voltage yield from several DC sources into a single output. Energy components, sunlight-based cells, ultra-capacitors, and other DC sources are examples. The basic idea behind multilayer inverters is to achieve a higher

sinusoidal voltage and current in the yield by including switches into the design. In multilayer inverters, where several switches are arranged, the exchanging edges are critical because the majority of the switches must be exchanged in such a way that the yield voltage and current have low symphonious twisting. There are three types of multilevel inverters [9, 10]. Multilevel inverters with diode clamping, multilevel inverters with flying capacitors, and multilevel inverters with a fallen H-connect. By increasing the number of levels, the THD will be reduced. Clearly, a yield voltage with low THD is appealing, but increasing the number of levels requires more equipment, and the control will become more complicated. It's a balance of price, weight, complexity, and a good yield voltage with low THD. Figure 1 shows the Power generation from Piezoelectric Footstep technique.

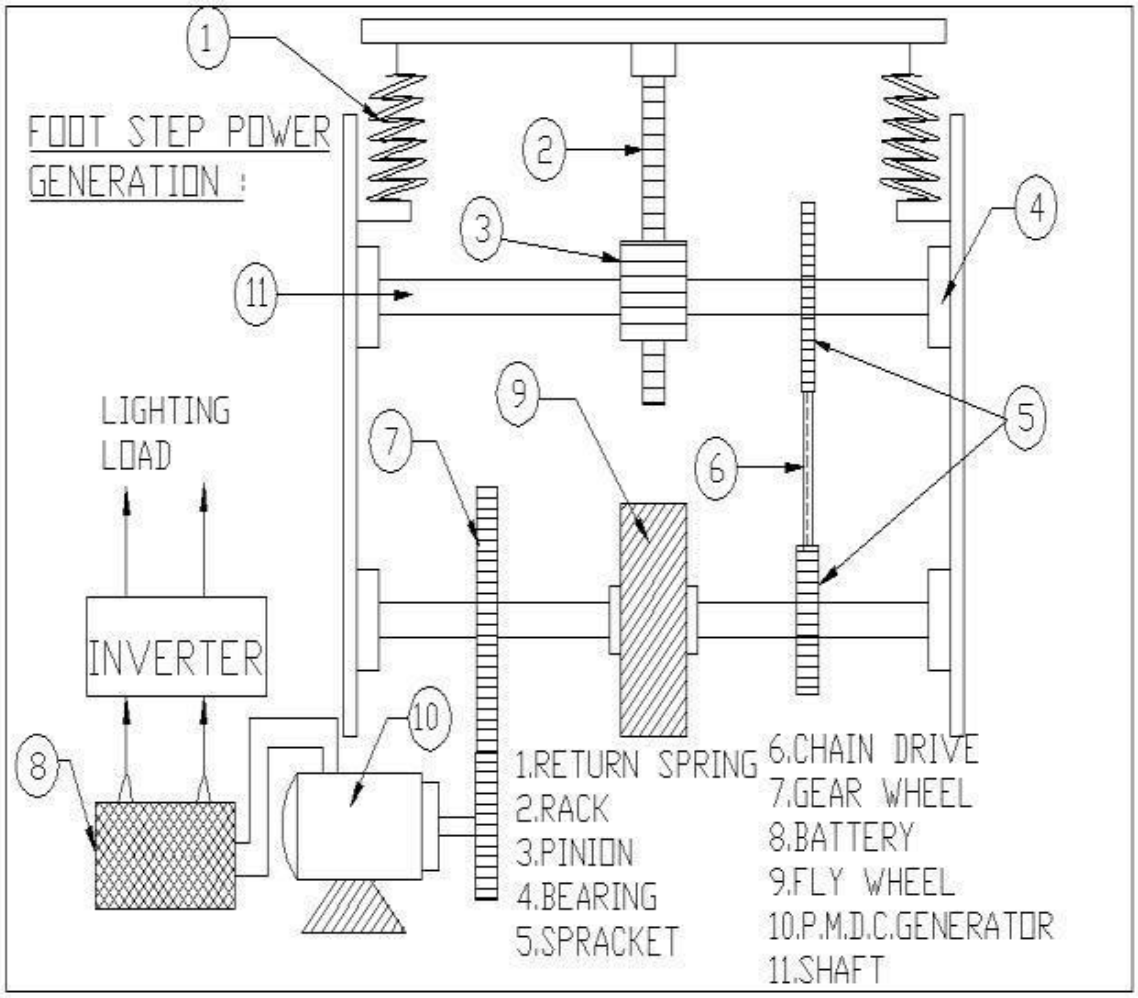

Figure 1. Power Generation from Piezoelectric Footstep Technique.

Three types of multilevel inverter have been used.

1. Cascaded H-bridge multilevel inverters
2. Flying Capacitor multilevel inverters
3. Diode Clamped multilevel inverters

CASCADED H-BRIDGE MULTILEVEL INVERTER

The concept behind this inverter is to provide a sinusoidal voltage yield by combining H-connect inverters. The yield voltage is the aggregate of the voltage that is produced by every cell. The quantity of yield voltage levels is 2n+1, where n is the quantity of cells. The exchanging points can be picked in a manner that the aggregate symphonious mutilation is minimized. One of the upsides of this sort of multilevel inverter is that it needs a smaller number of parts near to the Diode cinched or the flying

capacitor, so the cost and the heaviness of the inverter is not as much as that of the two previous sorts. demonstrates a n level fell H-connect multilevel inverter. The exchanging points count technique that is utilized as a part of this inverter is the same with respect to the past multilevel inverters. Figure 2 shows the Multilevel inverter.

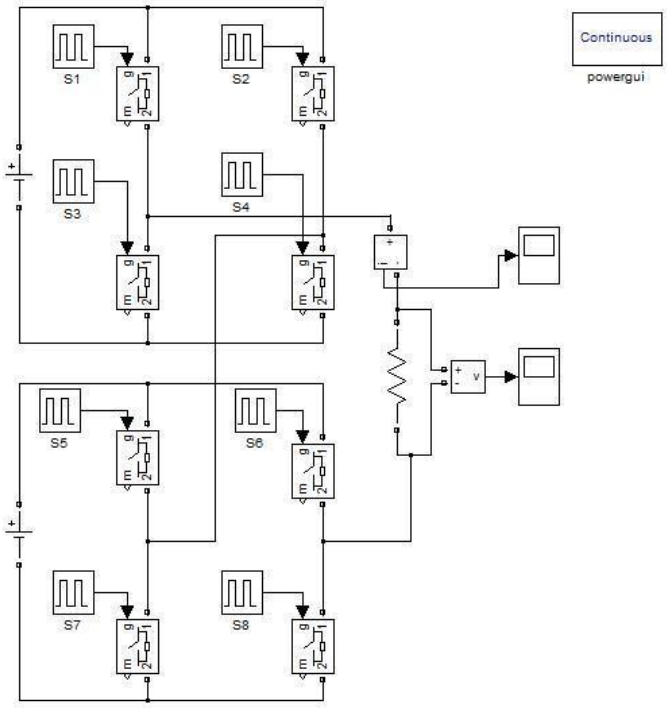

Figure 2. Cascaded H-Bridge multilevel inverter.

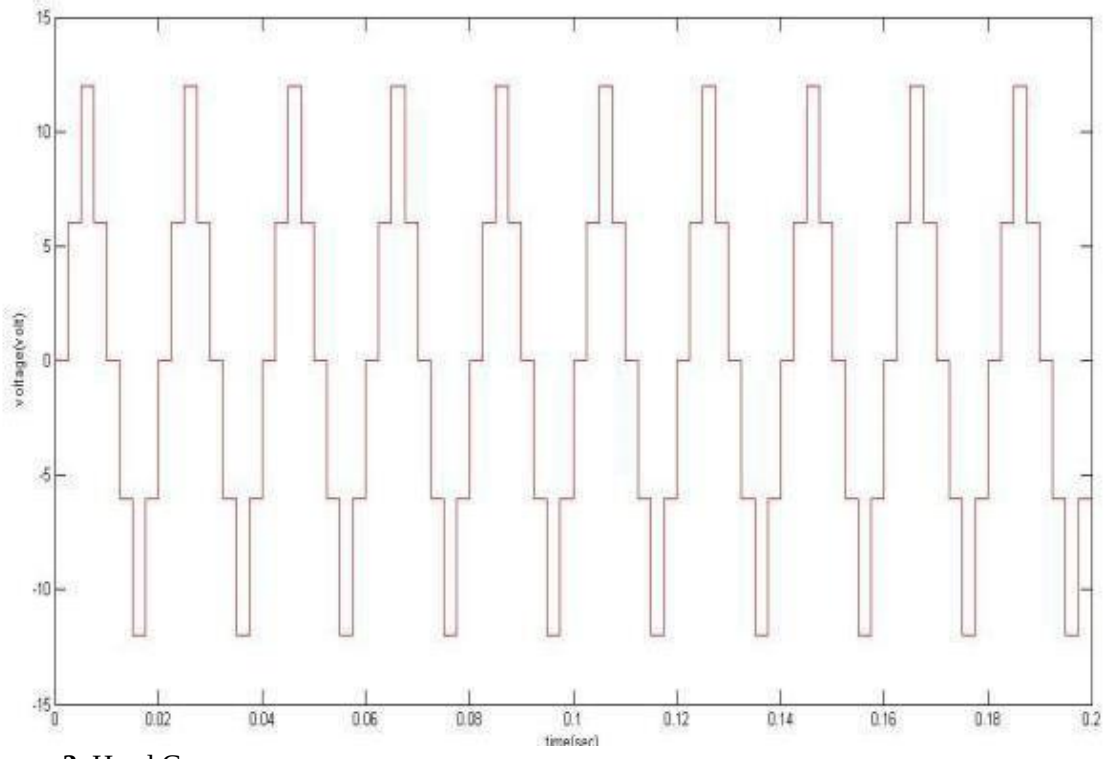

Figure 3. Head Cover.

The head cover is made from a vertical PE roll/tube as shown in Figure 3.

PROBLEM DEFINITION

Project description Footstep energy generation has the potential to be a cost-effective way to generate electricity. Walking is the most widespread kind of human activity. When a person walks, he loses energy to the road surface in the form of impact, vibration, and sounds, among other things, as a result of his weight being transferred to the road surface and his feet falling on the ground with each stride, resulting in kinetic energy being lost. This kinetic energy can be harnessed and turned into a form that can be used, such as electricity. A number of simple designs are put beneath the walking floor in this method. The piezoelectric transducers that generate electric power are compressed as a result of walking on this platform. The generated current is stored in the battery. More power will be generated as more individuals circulate. When pressure is applied to a piezoelectric transducer, it creates direct current (doubt) as an electrical generator. Statement of the Issue Almost all cities and villages in certain developing and newly industrialized countries have regular power outages for many hours. During a power outage, people in these nations can utilize a power inverter (rechargeable batteries) or a diesel/petrol-powered electric generator at home. Standby generators are commonly used in industrial and IT centers. This, in turn, exacerbates the electricity scarcity. The goal of this project is to generate power from footfall as a renewable energy source that may be produced by walking on specified arrangements like as walkways, stairs, and plate shapes, and these systems can be installed anywhere, especially in heavily populated places.

OBJECTIVES

The project's goal the major goal of this research is to produce a far cleaner, more cost-effective technique of electricity generation, which will assist to alleviate both global warming and power shortages.

Advantages and Unique Feature

- It is a renewable source of energy.
- It saves agricultural land.
- It is not harmful to atmosphere.
- No smoke or ash or any toxic chemical is produced.
- Utilized human waste walking energy into electrical energy.
- Economic
- Easy maintenance

Unique Features

- Reduce Environment pollution.
- Utilized renewable source of energy.
- Easy to install and Low Cost

METHODOLOGY

One of the critical concerns to be considered is the power situation. There may be a way to produce sufficient power utilizing renewable energy. Human population is the only far-reaching and all-weather resource that has not been exploited among these resources. We can extract the appropriate amount of power from this resource if we utilize the proper approach. We came up with the idea of using human walking power to generate electricity, and we designed a method called the footstep power generation platform, in which people walk on the platform and electricity is generated using the pressure created by the person's weight, which is then stored in batteries. The cascade H bridge inverter was employed to achieve the best results. A 5-level three-phase cascaded hybrid multilevel inverter with independent DC voltage sources of 24V and 48V that comprises of a typical 3-leg (one leg for each phase) and H-bridge in series with each inverter leg. This hybrid multilevel inverter's control signals are implemented utilizing an SPWM signal modulated technology and a digital technique.

Each part has different plate

Issues 1: The main issue was to obtain a top plate that similar measurement because most of the steel materials found in the market have different dimensions

Methods used in solving the issue – To solve the issue of un-proportionally, the measurements of the top plate were manually cut so that the cut plate conformed to the measurement that required for top plate hence making it easier to work with the device.

Issue 2: Getting the exact measurement of the base plate that would work with the device.

Method of solving – the measurements of the base plates was keenly done and to ensure efficiency the base plate was bigger than the top plate.

Issue 3: L bracket issues: The issue was obtaining the right material with the recommended tensile stress for L bracket. Obtaining actual measurements for the L bracket was also an issue.

Method of solving: cutting and arranging the L brackets manually. Accurate measurements before cutting were done to ensure efficiency

Expected outcomes

After going through the design steps in chronological order as mentioned below: -

- Design study of pasts. Electrical Power Generation from Footstep using 555 Timer IC
- Studying fundamental principles of dynamics of atmospheric flights.
- Design of first ever basic model based on knowledge acquired and with various idealizations.
- Preparation of three-dimensional CAD model.
- CFD analysis of CAD model to find Aerodynamics derivatives.
- Stability (static and dynamic) and control analysis using MATLAB.
- Real-time simulation on MATLAB.
- Results obtained out of all the processes mentioned above will conclude the design feasibility and stability characteristics of eVTOL model prepared.

COST ESTIMATION

The cost of running a footstep power producing system is nearly nil. This system has a life of roughly 106 load cycles.

Table 1. Parts of the structure.

Parts (structure)	Cost
1) Top Plate	1400
2) Rod Support	1800
3) L-Bracket	2100
4) Left/ Right Side Plate	1400
5) Left/Right Side Support	1800
6) Base Plate	2100
7) Spring	1400

(For 65 Kg workload). This system is only used for operational and maintenance purposes. The cost of electricity per watt generated is quite low. Table 1 shows the parts of the structure.

CONCLUSION:

This technology makes advantage of the wasted energy generated by humans when walking. Footsteps provide a constant and renewable supply of energy. The system operates repeatedly in a short period of time, and the turbine cannot maintain a consistent speed. As an outcome, there was voltage fluctuation, which was controlled by a voltage regulator.

REFERENCES

1. S. Hase, H. Shigeeda, T. Konishi, T. Yoshi. "Application of energy storage system for railway transportation in Japan Okui, S. Hase, H. Shigeeda, T. Konishi, T. Yoshi. The 2010 International Power Electronics Conference - ECCE ASIA.
2. Ashley Taylor and Tom krupenkin “Reverse electro wetting as a new approach to high power energy harvesting” Nature communication, pp 1-7August 2011.
3. Binoy Boban, Tom Jose V, Sijvo MT, “Electricty generation from footsteps; A Generative energy Resources”International journal of sciventic and research Publication 1-3,March 2013.
4. Muhammad Aamir Aman, Muhammad Zulqarnain Abbasi, Hamza Umar Afridi, Mehr-e-Munir, Jehanzeb Khan. Department of Electrical Engineering, Iqra National University, Pakistan. “Photovoltaic (PV) System Feasibility for Urmar Payan a Rural Cell Sites in Pakistan” J.Mech.Cont.& Math. Sci., Vol.-13, No.- 3, July-August (2018) Pages 173-179.
5. HR Nayan, “Power Generation Using Piezoelectric Material,” Journal of Material Sciences & Engineering Journal of Material Sciences & Engineering, vol 4, pp 1-4, 2015.
6. J. Ghosh, et al., “Electrical Power Generation Using Footstep for Urban Area Energy Applications,” 2013. International Conference on Advances in Computing, Communications and Informatics (ICACCI), 2013, pp 1367-1369.
7. K. Boby, et al., “Footstep Power Generation Using Piezo Electric Transducers”. International Journal of Engineering and Innovative Technology, vol 3, pp. 264-267, April 2014.
8. A. Majeed, “Piezoelectric Energy Harvesting for Powering Micro Electromechanical Systems (MEMS),” Journal of Undergraduate Research, vol 5, pp 1-5.
9. M.N.Gupta, et al., “Electricity Generation Due to Vibration of Moving Vehicles Using Piezoelectric Effect,” Electricity Generation Due to Vibration of Moving Vehicles Using Piezoelectric Effect, vol. 4 pp. 313-318. 2014.
10. R. M. Mahidur and R. Sarker, “Vibration Based Piezoelectric Energy Harvesting Utilizing Bridgeless Recitifier Circuit,” Jurnal Kejuruteraan, pp. 87-94, 2016.

