FOOT STEP BASED POWER GENERATION

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***Abstract*— In this paper, we have presented the design of power generation using footstep based on available piezoelectric sensors. Human race requires energy at very rapid rate for their living and wellbeing from the time of their arrival on this planet, because of this reason power resources have been worn out and enervated. Proposal for the employment and application of extravagant energy in foots of human is very much to the purpose for extremely populated nations like China and India. Where the streets, rail and bus station are over peopled and packed like sardines moving around the clock. So, using such concept the power can be availed and deployed by converting mechanical energy to electrical energy.**

Index Terms—Piezoelectric sensors, diode, inverter.

I. INTRODUCTION

Question that every time comes before every country i.e., the need of non□conventional energy sources or systems. The need of these systems and the answers are the growing consumption of energy has resulted in the country becoming increasingly dependent on fossil fuels such as coal, oil & gas. Rising prices of oil and gases and their potential shortages have raised uncertainties about the security of energy supply in future, which has serious repercussions on the growth of the national economy. The main factor is increasing use of fossil fuels also causes serious environmental problems. There is primary need to use renewable energy sources like solar, wind, tidal, biomass and energy from waste material and its some working principle. As technology is developed and the use of gadgets, electronic devices also increased. Power generation using conservative methods becoming deficient. There is a necessity arises for a different power generation method. At the same time the energy is wasted due to human locomotion and many ways. To overcome this problem, the energy wastage can be converted to usable form using the piezoelectric sensor. This sensor converts the pressure to voltage, by using the energy saving method that is the footstep power generation system. It is used to generate voltage using footstep force. The proposed system works as a medium to generate power using force. This is very useful in public places like bus stands, theaters, railway stations, shopping malls, etc. So, these systems are placed in public places where people walk and they have to travel on this system to get through the entrance or exists. Then, these systems may generate voltage on each and every step of a foot. For this purpose, piezoelectric sensor is used in order to measure force, pressure and acceleration by its change into electric signals. This system uses voltmeter for measuring output, LED lights, weight measurement system and a battery for better demonstration of the system. In another way, we are also saving natural energy resource

II. LITERATURE REVIEW

T Jintanawan *et al* [l] worked on " Harvesting Kinetic Energy of Footsteps on Specially Designed Floor Tiles". This paper introduces an exploratory model for utilizing the kinetic energy of footsteps. The model consists of three wood layers. The bottom and top layer having the same dimensions are connected through springs. The use of springs makes walking on the tile flexible. The middle layer is installed with the 35 Piezoelectric units connected in series/parallel connection. A practical examination was performed at the University of

Jordan to compute the expected energy generation if commercial tiles are lodged.

RM Veena *et al* [2] worked on "Maximum energy harvesting from electromagnetic micro generators by footsteps using photo sensor"**.** The root aim of this project is to harvest utmost energy from electromagnetic micro generators. Most electromagnetic generators use the process of electromagnetic induction while someof these use renewable energy sources such as water power and wind power to create the initial mechanical energy. This project uses the principle of electromagnetic induction and converts the pressure energy into the electrical energy. The control mechanism carries the copper coil and bar magnetic to generate voltage, and a rechargeable battery is used to store this generated voltage. The idea is to utilize the unused energy released by footsteps at populated places such as roads, railway stations, temples and bus stops.

R Meier *et al* [3] worked on "A Piezoelectric Energy-Harvesting Shoe System for Podiatric Sensing**".** This paper provides an energy-harvesting, shoe mounted system for medical sensing using piezoelectric transducers for generating power. The electronics are integrated inside a conventional consumer shoe, measuring the pressure of the wearer's foot exerted on the sole at six locations. The electronics are completely powered by the harvested energy from walking or running, generating lo- 2o µJ of energy per step that is then consumed by capturing and storing the force sensor data. The overall shoe system demonstrates that wearable sensor electronics can be adequately powered through piezoelectric energy-harvesting.

Mohammed Saleh *et al* [4] worked on " Foot-Step Power Generation". In this project the proposed system is to are generate electrical energy by means of a non- conventional method just by walking on the footsteps. Non-conventional system for energies is very much required at this time. Energy generation using footsteps requires no any fuel input to generate electricity. In this project we are generating electricity just with the help of rack and pinion arrangement along with alternator and chain drive mechanism. For its proper functioning such that it converts Force into electrical energy, the mechanism consists of rack & pinion, chain drives, alternator and battery. Various alternate applications with extension have also been discussed. The power generation is much worthy but it has little initial cost-effective factors.

Tom Jose V *et al* [5] worked on " Electricity Generation from Footsteps, A regenerative energy resource" .In these research paper author manufactured a model made from stainless steel, recycled car tires and recycled aluminium, also includes a lamp embedded in the pavement that lights up every time a step is converted into energy (using only 5 percent of the generated energy). The average square of pavement produces about 2.l watts of electricity. And according to author, any one square of pavement in a high-foot traffic area can see 5o,ooo steps a day. Based on this data, only five units of Pavegen pavement can be enough to keep the lights on at abus stop all night.

Harsha Vardhini *et al* [6] worked on "Human Footstep Power Harvesting Systems using Piezoelectric Sensor Technology". Power has a lot of application in our daily life and the technology made the devices to improve the application of natural power in many more efficient ways. Many ways exist to generate power. To generate electricity, in smartest ways, foot step energy generation could be the efficient method for the generation of electricity. Man uses power whenever needed without thinking about the consequences to be faced in future. Due to this many of the resources have been diminished. We can convert the energies into usable forms such as electrical form and many other forms. This device saves power and has the capacity of converting energy produced by foot into the electrical form. Energy through pedal is an efficient source for power production. Man's kinetic energy is useful in many ways and also the power generation is easy and can be efficiently done. These technologies generate power for all electronic appliances.

Baswaraj Gadgay *et al* [7] worked on "Foot Step Power Generation Using Piezoelectric Materials electrical energy utilization is expanding dramatically". Consequently, the need of a secure and financially reasonable force age and dissemination framework requests a specific interest. This paper proposes a model that utilizes human strolling, hopping and running as a well spring of energy and stores it for fundamental use. Such a model is able in demography that of a nation like India which has

a particularly immense person on foot populace. This paper represents a technique for gathering this human headway energy with the utilization of piezoelectric sensor and shows an application with the put away energy for example tocharge a cell phone safely and also used to glow an lED based on the motion using the passive infrared sensor. The ground response power (GRF) applied from the foot, when changed over to voltage by piezoelectric sensors is sufficiently fit to control up a device. Progressive effort prompts a periodic voltage develop which with appropriate hardware can be utilized to charge a capacity battery. The force created by this method can likewise be utilized in essential application, for example, road lighting, notice sheets, exercise centers and different spaces of public area. It likewise advances efficient power energy and climate agreeable methodology towards energy age. In this paper we have given the essential idea and configuration subtleties of this model and a fundamental execution of the equivalent.P.Venkatesh *et al* [8] worked on "The Design of Power Generation using Footstep Based on Available Piezoelectric Sensors". Human race requires energy at very rapid rate for their living and wellbeing from the time of their arrival on this planet, because of this reason power resources have been worn out and enervated. Proposal for the employment and application of extravagant energy in foots of human is very much to the purpose for extremely populated nations like China and India. Where the streets, rail and bus station are over peopled and packed like sardines moving around the clock. So, using such concept the power can be availed and deployed by converting mechanical energy to electrical energy.

III. SYSTEM DESIGN AND IMPLEMENTATION

Piezoelectric Effect is the ability of certain materials to generate an electric charge in response to applied mechanical stress. The word Piezoelectric is derived from the Greek piezein, which means to squeeze or press, and piezo, which is Greek for"push".

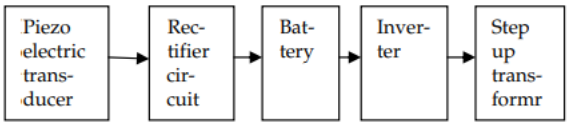

Figure 1: Block diagram of voltage generation

This circular shape piezoelectric transducer has been choose because it is most suitable transducer for footstep rather than square piezoelectric transducer. The circular shape of piezoelectric give higher output voltage when testing on oscilloscope. This is due to the deflection on its structure when foot press is applied on it. The piezoelectric transducer is connected in series-parallel connection where the value of voltage as well as current output are both satisfactory. The output of the piezoelectric is in AC form. Before being stored in storage components such as battery or capacitor, it needs to be rectified into DC form then, supply it to the DC loads. In this study, the full wave bridge rectifier was used to rectify the output from the piezoelectric tile. The full wave bridge that is used in the study consist of four diodes and two capacitors as shown in Figure 1. One of the capacitors acts as smoothing capacitor to filter the output waveform and another one as a storage component to store the energy. This full wave bridge rectifier operation is divided into two-cycle which are positive half-cycle and negative half-cycle. The four diodes labelled D1 to D4 are arranged in "series pairs" with only two diodes conducting current during each half cycle. During the positive half cycle of the supply, diodes D1 and D2 conduct in series while diodes D3 and D4 are in OFF condition as they are now in reserve biased and the current flows through the two capacitors. During the negative half cycle of the supply, diodes D3 and D4 conduct in series as they are in forward biased, but diodes D1 and D2 are in reverse biased. The current flowing through the capacitors is the same direction as before. One of the capacitor acts as smoothing filter and another one acts as storage element. Both of them are connected in parallel. The voltage in the AC form is being rectified in the DC form in full bridge rectifier circuit, then it goes to the smoothing capacitor to remove any ripple factor that still left in the DC voltage form after the rectifier process. Lastly, the output from the piezoelectric tile is stored in the storage capacitor and ready to be used by another low power

devices.

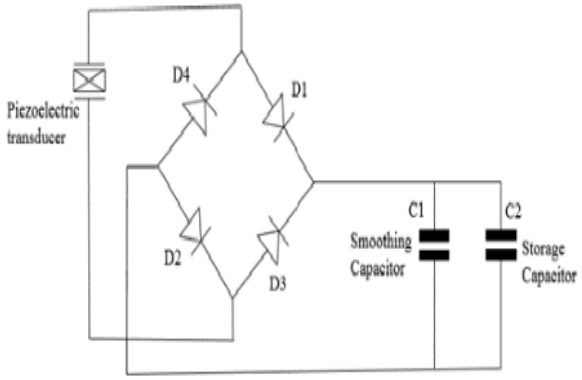

Fig 2: Circuit Diagram of the full wave bridge rectifier with smoothing and storage capacitor

IV. ADAVANTAGES

- Simply walking on the step it generates power
- No need fuel input.
- This is a Non-conventional system.
- No moving parts long service life.
- Compact yet highly sensitivity.
- Self generating no external power required.
- Reliable, Economical ,Eco-friendly

V. RESULTS AND ANALYSIS

The piezoelectric transducer output is in AC waveform. The output of the transducer needs to be rectify and filtered before being used to the storage or to the DC loads. Figure 3 shows the output of the piezoelectric transducer before being inserted to the full bridge rectifier.

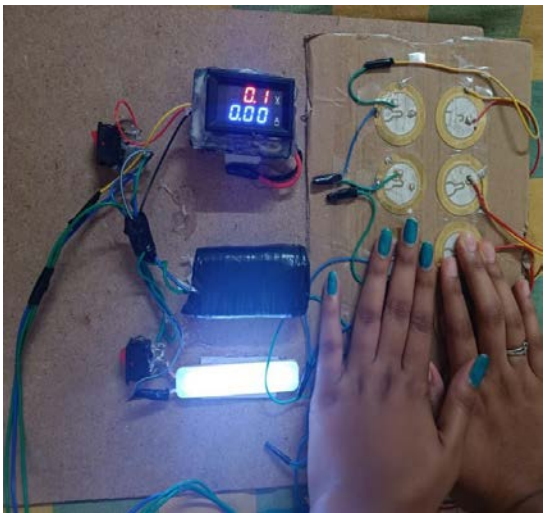

Fig 2: Snapshot of Foot step Based Power Generation of 0.1V

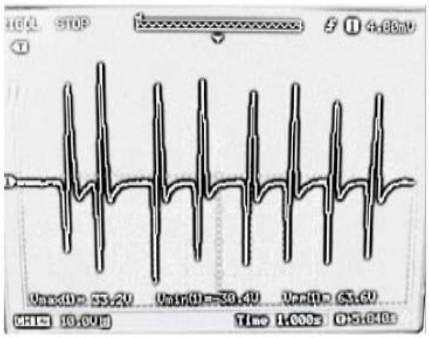

Fig 3: Output Of The Foot Step Based Power Generation In Waveform

VI. CONCLUSION

A piezoelectric tile is capable of generating more voltage when longer the time taken. The longer the time taken means more footstep/force are applied on the tile. The linear relation is found between the voltage generated and the time taken. This piezoelectric are specifically suitable for the implementation in the crowded area such as pavement street, train ticket counter, stairs and dance floor. The piezoelectric tile is also suited for the exercise tile such as for skipping or on the treadmill. The power that is generated from this piezoelectric tile can be used to power up the light street, light along the stairs and also low power appliances.

VII. FUTURE SCOPE

Foot Step arrangement is used to generate the electric power.As the power demand is increasing ,this arrangement is used to generate the electrical power in order to meet the large energy demand In this arrangement the mechanical energy is converted into electrical energy.Utilization of wasted energy is very much relevant and important for highly populated countries in future has already started experimenting the use of piezoelectric effect for energy generation they implement piezoelectric effect on the walking tiles.

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