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FOOTSTEP POWER GENERATION USING PIEZO-ELECTRICITY

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ABSTRACT

Man has been in need of energy and use it at an increasing rate for sustenance and prosperity since time immemorial. As a result of this a lot of energy resources have been exhausted and wasted. The proposal to use jet energy for foot strength with human movement is very relevant and important for high-density countries such as India where railway station, temples and others are crowded around the clock. When the flooring is engineered with piezoelectric technology, the electrical energy produced by the pressure is captured by ground sensors and converted into an electrical charge by piezo transformers, then stored and used as an energy source. This power source has many applications as in agriculture, home application and street lighting as an energy source for sensors in remote locations.

KEYWORDS: Piezoelectricity, PZT, PVDF, Inverter, PIC16F873.

INTRODUCTION

At present, electricity has become the lifeline of the human population. Her demand is increasing day by day. Modern technology needs a huge amount of electrical power for its various operations. Electricity production is the biggest source of pollution worldwide. On the one hand, growing concern about the gap between demand and supply of electricity has highlighted to the public the exploration of alternative sources of energy and their sustainable use. On the other hand, the worldwide population, and hence the demand for energy, is increasing day by day. Accordingly, the objective of the current invention is to provide a way to generate electricity from this growing population which does not adversely affect the environment. The technology is based on a principle called piezoelectric effect, in which some materials have the ability to build an electrical charge of pressure and pressure applied to them. PV refers to the ability of some materials to generate electrical energy in response to applied pressure. Harvesting energy means that energy is already available, but will be lost if not used. The piezoelectric material embedded can provide the magic of the pressure exerted by people moving in the electric current.

RESEARCH ELABORATIONS

STUDY OF PIEZO MATERIALS

Porcelain piezoelectric belong to a group of transparent electrolyte materials. Photovoltaic materials are crystals that are polar without an electric field being applied. The piezoelectric effect is common in piezoelectric ceramics such as PbTiO3, PbZrO3, PVDF and BIT. The main component of the project is piezoelectric material. The right choice for piezo material is of utmost importance. For this, an analysis was made on the 2 most common piezoelectric materials available - bits and PVDFs, to determine the most suitable materials. The standard selection was the best output voltage for various applied pressures. In order to understand the corresponding output of different application forces at present, electricity has become the lifeline of the population of the population. Her demand is increasing day by day. Modern technology needs a huge amount of electrical power for its various operations. Electricity production is the largest source of pollution worldwide. On the one hand, growing concern over the gap between demand and supply of electricity has led the public to explore alternative sources of energy and their sustainable use. On the other hand, the world's population, and hence the demand for energy, are increasing day by day. Accordingly, the objective of the current invention is to provide a means to generate electricity from this population growth which does not adversely affect the environment. The technology is based on a principle called piezoelectric effect, in which some materials have the ability to build an electrical charge of

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the pressure and pressure applied to it. PV refers to the ability of some materials to generate electricity in response to applied pressure. Energy harvesting means that energy is already available, but will be lost if not used. The piezoelectric embedded material can provide magic for the pressure exerted by people moving in the voltage. The characteristics of V-I of all materials are bits and PVDFs have been drawn. For this the piezo transformer material is placed under the test on the peso power sensor. Voltmeters are connected to each other to measure voltages and an ammeter is connected to measure the current. As different forces are applied to piezo materials, different voltage readings are displayed corresponding to the force. For each voltage reading such as cross-force sensor, different voltage and current readings are observed from the piezo test materials.

Piezoelectric - A piezoelectric element like PZT, PVDF, etc., is used as transducer means to convert the kinetic energy into electrical energy upon stepping on the floor tile. Deformation of the piezoelectric element caused by the load acting the tile induces charges which can be siphoned off.

Magnetic - Transducer means comprises a magnetic element and a conductive element, wherein one of the elements is movably coupled to the floor surface. When a pressure is applied on the floor surface, the conductive element cuts the magnetic flux and so current is induced in the conductive element.

Generator - A mechanical arrangement viz. hydraulic, pneumatic and spring is coupled to the floor surface, such that a rotor of a microgenerator arranged in the floor tile is driven by the mechanical arrangement when a force acts on the floor surface.

Static - A capacitor is formed in the floor tile by using two charging layers uniformly separated by a small gap, wherein one layer is coupled to the tile surface through springs. By pressing the tile surface, the gap between the layers is altered and so charges are induced in the layers. These charges can be extracted by suitably connecting the layers to an external circuit.

WORKING

The piezoelectric material converts the applied pressure into electrical energy. The pressure source can be either from the weight of moving vehicles or from the weight of people walking on them. The piezoelectric material output is not fixed one. Therefore a bridge circuit is used to convert this variable voltage to a single linear. Once again the filter is used to filter out any other fluctuations in the output. The DC output voltage is then stored in a rechargeable battery. As the energy output of one peso film was too low, a combination of a few peso films was investigated. Two potential connections - parallel and communication series - have been tested. The parallel connection showed a significant increase in output voltage. With a series connection, the additional piezo film results in increased output voltage but not in linear proportion. So here a combination of both a parallel and a

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connection string is used to produce a 40V output voltage with high current intensity. The battery provisions are provided to connect DC load. The inverter is connected to the battery to provide a saved connection connection. The output voltage can be seen across the tiles in LED. For this purpose the PIC16F873A microcontroller is used. The crystal oscillator controller is used to operate it. The output is then given a microcontroller which then displays the voltage levels.

ANALYSIS DONE ON THE PIEZO TILE

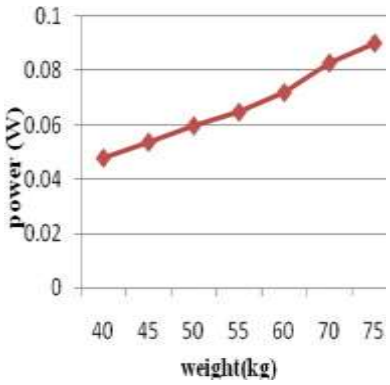
People whose weight varied from 40kg to 75 kg were made to walk on the piezo tile to test the voltage generating capacity of the Piezo tile. The relation between the weight of the person and power generated is plotted in figure 8. From the graph it can be seen that, maximum voltage is generated when maximum weight/force is applied. Thus, maximum voltage of 40V is generated across the tile when a weight of 75 Kg is applied on the tile.

$$\frac{1}{Ceq} = \frac{1}{C1} + \frac{1}{C2} + \frac{1}{C3}$$

$$Q = C * V$$

$$C = \frac{Q}{V}$$

$$\frac{Veq}{Q} = \frac{V1}{Q} + \frac{V2}{Q} + \frac{V3}{Q}$$



CONCLUSION

Piezo tiles have been developed capable of generating 40V. Comparison of different electric piezo materials shows that bits are superior in properties. Also, through the comparison found that the correlation between the parallel chains is more convenient. The weight applied to tiles and corresponding voltage generated is studied and found to have a linear relationship. They are particularly suitable for implementation in crowded areas. This can be used in street lighting without using long power lines. It can also be used as charging ports, lighting of pavement side buildings.

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