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A PATH FOR HORIZING YOUR INNOVATIVE WORK

GENERATION OF PIEZOELECTRICITY FOR AC AND DC LOAD

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Abstract: The present project deals with the generation of electricity through traffic pressure by placing piezoelectric generators on the roads the axial load of the traffic pressure deforms the generator and thus produces the electric energy as an output, this output may use for the street lighting, and many more aspects. When the flooring is engineered with piezo electric technology, the electrical energy produced by the pressure is captured by floor sensors and converted to an electrical charge by piezo transducers, then stored and used as a power source. And this power source has many applications as in agriculture, home application and street lighting and as energy source for sensor.

Keywords: Piezoelectricity(Quartz), Electrical power



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INTRODUCTION

Energy is the ability to do work while energy surrounds us in all aspects of life, the ability to harness it and use it for constructiveness as economically as possible is the challenge before mankind. Alternative energy refers to energy sources, which are not based on the burning of fossil fuels or the splitting of atoms. The renewed interest in this field comes from the undesirable effects of pollution both from burning fossil fuels and from nuclear waste byproducts. Fortunately there are many means of harnessing energy, which have less damaging impacts on our environment in India.

The one of major source of external energy which can be used to separate outer orbit electrons away from their parent atom is pressure. Whenever you speak into a telephone or any similar type of microphone, the pressure waves of the sound energy which your voice generates make a diaphragm move. This diaphragm movement can be used to give rise to an electric charge in the following way. There exist in nature certain materials whose crystals develop an electric charge when pressure (as from a moving diaphragm) is exerted on them. Quartz, tourmaline and Rochelle salts are examples. If a crystal from one of the material is placed between two metal plates and pressure is exerted on the plates, an electric charge will be created between the plates. Its size will depend on the amount of pressure exerted. It is also possible to convert electrical energy back into mechanical energy by placing an electric charge on the plates of such a device. The crystal will then expand or contract by a small amount, depending on the amount and type of the charge applied; and the mechanical energy so created can also be put to use. Appearance of an electric field in certain non-conducting crystals as a result of the application of mechanical pressure. Pressure polarizes some crystals, such as quartz, by slightly separating the centers of positive and negative charge. The resultant electric field is detectable as a voltage. The piezoelectric effect is reversible in that materials exhibiting the direct piezoelectric effect (the production of an electric potential when stress is applied) also exhibit the reverse piezoelectric effect (the production of stress and/or strain when an electric field is applied). The power generated by the foot step generator can be stored in an energy storing device. The output of the generator was fed to a 12 V lead acid battery through an ac-dc converter bridge. Initially, the battery was completely discharged.

Piezoceramic analysis

Man has needed and used energy at an increasing rate for his sustenance and wellbeing ever since he came on the earth a few million years ago. Due to this a lot of energy resources have been exhausted and wasted. Proposal for the utilization of waste energy of foot power with human locomotion is very much relevant and important for highly populated countries like

India and China where the roads, railway stations, bus stands, temples, etc. are all over crowded and millions of people move around the clock. This whole human bio-energy being wasted if can be made possible for utilization it will be great invention and crowd energy farms will be very useful energy sources in crowded countries. In this project we are generating electrical power as non-conventional method by simply walking or running on the foot step. Non-conventional energy system is very essential at this time to our nation. Non-conventional energy using foot step is converting mechanical energy into the electrical energy. This project uses piezoelectric sensor.

In this project the conversion of the force energy in to electrical energy. The control mechanism carries the piezoelectric sensor, A.C ripples neutralizer, unidirectional current controller and 12V, 1.3Amp lead acid dc rechargeable battery and an inverter is used to drive AC/DC loads. The battery is connected to the inverter. This inverter is used to convert the 12 Volt D.C to the 230 Volt A.C. This 230 Volt A.C voltage is used to activate the loads. We are using conventional battery charging unit also for giving supply to the circuitry. This project uses regulated 5V, 500mA power supply. 7805 three terminal voltage regulator is used for voltage regulation. Bridge type full wave rectifier is used to rectify the ac output of secondary of 230/12V step down transformer.

Study of piezoelectric material

Piezoelectric ceramics belong to the group of ferroelectric materials. Ferroelectric materials are crystals which are polar without an electric field being applied. The main component of the project is the piezoelectric material. The proper choice of the piezo material is of prime importance. For this, an analysis on the 2 most commonly available piezoelectric material - PZT and PVDF, to determine the most suitable material was done. The criterion for selection was better output voltage for various pressures applied. In order to understand the output corresponding to the various forces applied, the V-I characteristics of each material namely, PZT and PVDF were plotted. For this the Piezo transducer material under test is placed on a Piezo force sensor. Voltmeters are connected across both of them for measuring voltages and an ammeter is connected to measure the current. As varying forces are applied on the Piezo material, different voltage readings corresponding to the force is displayed.

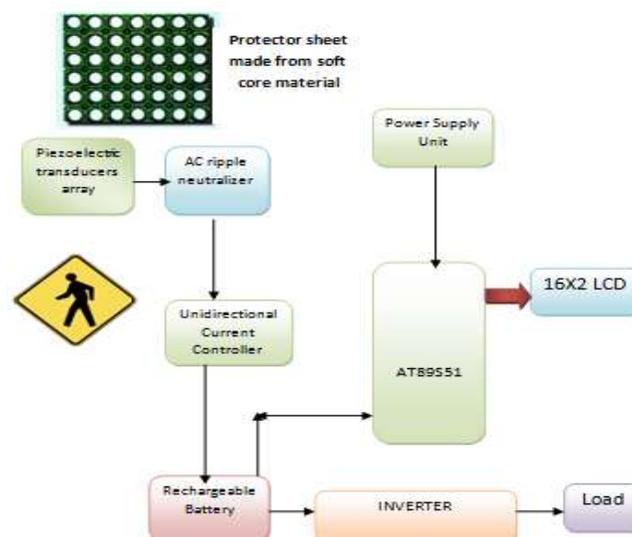
2. WORKING

The piezoelectric material converts the pressure applied to it into electrical energy. The source of pressure can be either from the weight of the moving vehicles or from the weight of the people walking over it. The output of the piezoelectric material is not a steady one. So a bridge

circuit is used to convert this variable voltage into a linear one. Again an AC ripple filter is used to filter out any further fluctuations in the output. The output dc voltage is then stored in a rechargeable battery. As the power output from a single piezo-film was extremely low, combination of few Piezo films was investigated. Two possible connections were tested - parallel and series connections. The parallel connection did not show significant increase in the voltage output. With series connection, additional piezo-film results in increased of voltage output but not in linear proportion. So here a combination of both parallel and series connection is employed for producing 40V voltage output with high current density. From battery provisions are provided to connect dc load. An inverter is connected to battery to provide provision to connect AC load. The voltage produced across the tile can be seen in a LCD.

The working of footstep power generation system involves three distinct phase. Sensor interface and Transducing: Consists array of piezoelectric sensors Kinetic energy is converted into electrical energy. Here the generated degraded vibrating voltage will be fed to different blocks of circuit element to get a proper output Storage Resultant output will be stored in a battery

Block Diagram



Whenever pressure is applied on piezoelectric sensor that pressure is converted into Electrical energy. That minute voltage which is stored in the Lead Acid battery. That voltage is used to drive DC loads. Here we are using AT89C51 to display the amount of battery get charged.

3. CONCLUSION

The proposed work “Electrical Power Generation through footsteps” has been successfully tested and implemented which is the best economical, affordable energy solution to common people. This can be used for many applications in rural areas where power availability is less or totally absent. India is a developing country where energy management is a big challenge for huge population. By using this project we can drive both A.C. as well as D.C loads according to the force we applied on the piezoelectric sensor.

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