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Piezoelectric Based Wireless Mobile Charger

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Abstract
There are various ways through which the electrical energy can be generated and one among those is the generation of electrical energy through piezoelectric cells. When a person walks on the steps where piezo cells are installed the pressure that is generated from the human movement is converted in to electrical energy. The energy which is generated by the piezoelectric generator can be used to charge the mobile battery wirelessly. The charging of mobile phones through the piezoelectric cells wirelessly is an efficient technique to utilize the mechanical energy from the human movements and to convert the corresponding energy in to useful electrical energy. The principle behind piezoelectric wireless power transmission is electromagnetic induction.
Keywords: *Piezoelectricity, Wireless Power Transfer, Electromagnetic induction, Mobile charging*.

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I. INTRODUCTION

Nowadays electrical energy is a primary want of each day life. In present existence such a lot of technologies are used to generate electricity. Therefore, the main objective of the current technologies is trying to invent and provide a pollutants loose approach of electricity generation. On this era piezoelectric sensors are used to generate the power. Walking is a common activity of humans through which the piezoelectric sensors capture the force applied on the floor and they will convert it in to electrical energy. The technique used here is electromagnetic induction in the wireless circuit.

In these days there has always been an interest enhancing in the mobile technology. But since the technology evolves there are also some problems associated with it. The major problem people are facing today in this mobile technology is fast draining of battery life. Every smart phone user wishes that he had more battery life. And this is possible by using this technique which is piezoelectric based mobile charger. The mechanical energy is harvested from the human movements and is converted in to electrical energy which is used to charge the mobile battery wirelessly. Here the mechanical energy from the human movements is utilized efficiently to charge the mobile battery.

In the recent years the usage of smart phones has increased to a greater extent but as we know that the life of the smart phone battery is not too long. Almost every smart phone user wishes that they had more battery life. So, in order to overcome the issue of fast draining of mobile battery we present this technique which is called piezoelectric based wireless mobile charger. In this technique a mobile charging system is designed to charge the mobile battery wirelessly through piezoelectric cells which generates the electrical energy from the mechanical energy generated from human movements.

1.1 Objective

The major objective of this project is to harvest the mechanical energy from human movements and to utilize the mechanical energy generated in to useful electrical energy. The electrical energy which is generated through the piezoelectric generator is utilized to charge the mobile battery through wireless power transfer technique. The mobile battery gets charged wirelessly which is a great advantage to the smart phone users whose mobile battery gets drained quickly. This principle behind this technique is the electromagnetic induction through which the mobile battery gets charged through the wireless power transfer technique.

II. EXISTING SYSTEM

In the existing system the piezoelectric generator is installed in the shoe sole. When a person walks the mechanical energy generated from the human movement is converted in to electrical energy through the piezo cells connected within the shoes. The electrical energy is then utilized to charge the mobile battery wirelessly through wireless power transfer technique. The difference is that the piezo cells are installed within the shoes but in this current technique the piezo panels are installed on the steps which is more efficient technique as compared to the existing technique.

The major drawbacks of existing system are, it is quite difficult to install the entire circuitry in the shoe sole which might add the additional weight to the shoes and to the person who wore the shoes. Upon using the shoes continuously, the wear and tear of the shoes may take place due to which the connections of the circuit may damage. The magnetic field may decay in the air due to this technique. The person must carry the battery along with them in order to charge the mobile.

III. PROPOSED SYSTEM

In order to overcome the drawbacks of the existing method, an efficient method is proposed which is piezoelectric based wireless mobile charging method through which one can charge their smart phones wirelessly without any interruption. By this method the energy acquired from the human movements is converted in to electrical energy. Wireless power transfer technique is used to charge the mobile battery. Piezoelectricity is defined as the electrical energy produced from mechanical pressure. The utilized energy from human movements is transferred to the device wirelessly. By using wireless technique, the mobile battery gets charged wherever the method is implemented.

Electricity harvesting devices can now be used in a variety of ways to meet power demand. The piezoelectric crystal is used to generate the electrical energy from vibrations in the environment. The crystalline structure of the piezoelectric materials allows them to transform the mechanical energy in to electrical energy. These materials can collect mechanical energy from the environment and convert it in to electrical energy that can be utilized to power the electronic devices.

3.1 Block Diagram

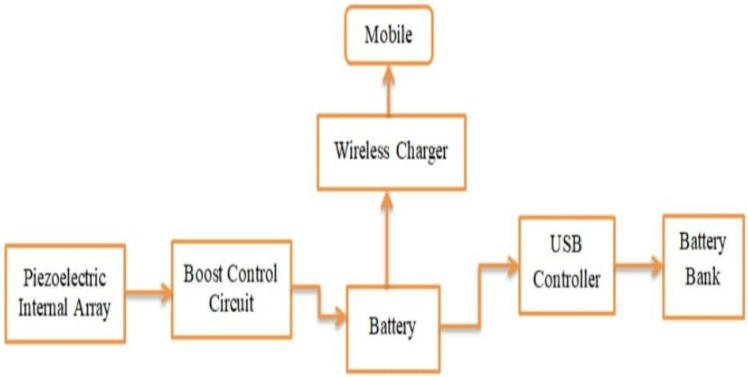

Fig-1: Block Diagram

From the above block diagram, the piezoelectric internal array is installed on the steps. The piezoelectric cells are connected in series on each piezoelectric panel. We have connected three piezoelectric panels in parallel. The output from the three panels together is connected to the boost control circuit which boosts up the voltage that is required for the battery. And the voltage from the battery is given as the input to the wireless circuit through which the mobile battery gets charged. And in order to prevent the wastage of energy generated the battery bank is used. The USB controller is connected to the battery output and the output of the USB controller is given to the battery bank to store the excess energy for future purpose.

3.2 Components

a) Piezoelectric Array

The piezoelectric array is the material that can produce electricity upon the application of mechanical stress. The mechanism involves the development of electric charge due to the movement of electrons upon the application of stress. Piezoelectricity is the process of using crystals to convert the mechanical energy in to electrical energy.

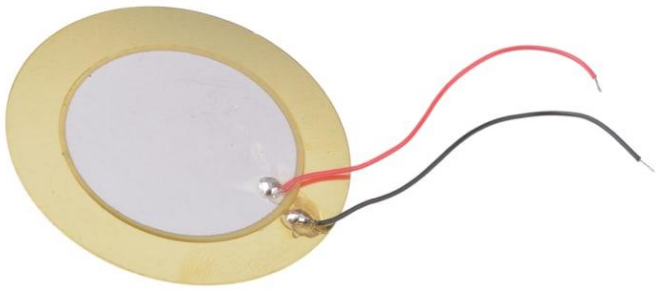

Fig-2: Piezoelectric Array

b) Boost control circuit

The boost control circuit is used to step up an input voltage to some higher level, required by the load. A boost converter is nothing but a dc-to-dc power converter. The boost control circuit steps up the voltage to the desired value which is set manually. The boost converters are used to generate a DC output voltage that is greater than the DC input, therefore boosting up the supply voltage.

Fig-3: Boost control circuit

c) Battery

The battery is a device that stores the chemical energy and converts it in to electrical energy. The lead-acid battery is a type of rechargeable battery. The flow of electrons provides an electric current that can be used to do work. The battery is a source of electrical power which consists of one or more electrochemical cells which are having the electrical connections for powering electrical devices. It is reliable and simple to manufacture.

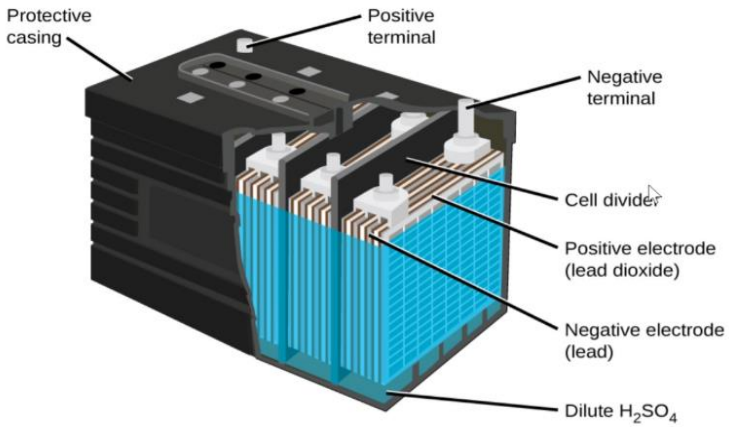

Fig-4: Battery

d) Wireless PCB circuit

The wireless power transmission can be defined as the energy that can be transmitted from the transmitter to the receiver through an oscillating magnetic field. To achieve this the DC is converted in to high frequency ac by particularly designed electronics. Wireless power transmission or the wireless energy transmission or electromagnetic power transfer is the transmission of without wires or conductors. The wireless power transmission is the transmission of electrical energy from power source to the load without any physical connectors such as wires or conductors. The principle behind wireless power transmission is the electromagnetic induction.

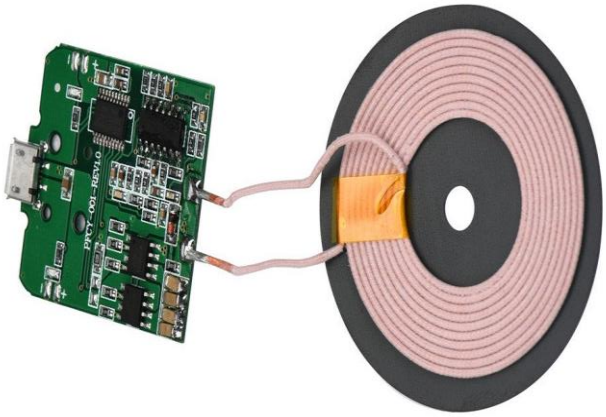

Fig-5: Wireless PCB circuit

e) USB Controller

The USB is designed to standardize the connection or peripherals to personal computers. It is used both to communicate with and to supply the electric power. USB is an industry standard that establishes specifications for cables, connectors, and protocols for connection. The USB stands for Universal Serial Bus. The USB can be used either to connect the devices or to transfer the data from one device to other device. It also provides the specification for the connectors and the cables.

Fig-6: USB controller

f) Battery bank

The battery bank or a power bank is a portable charger. It works by storing the energy in their batteries, which charges the electronic devices. Battery banks can recharge smart phones, tabs, laptops, and Bluetooth devices. A battery bank is a wireless battery that can receive and produce charge. The battery bank is nothing but a power bank which stores the electric charge. It is used for storing the electric charge and to recharge the mobiles whenever required by the user.

Fig-7: Battery bank

4. WORKING MODEL

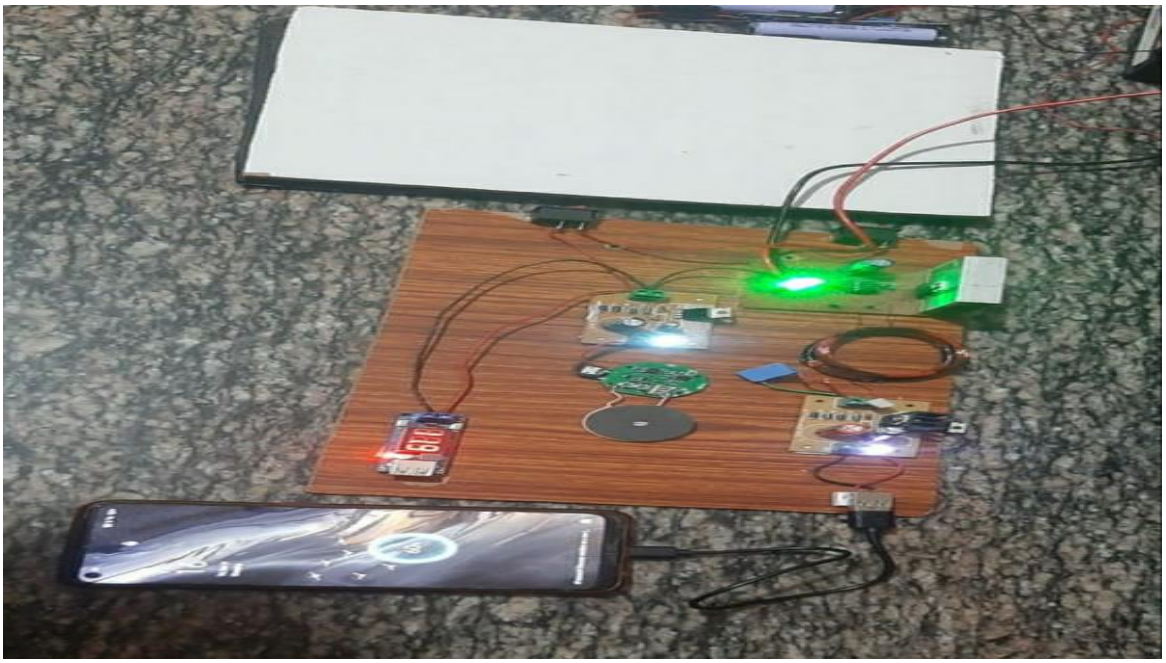

Fig-8: Working Model

IV. EXPERIMENTAL RESULTS

- The energy generated by each piezo buzzer = 5 v
- The total energy generated by the piezo panel before boosting = 3.7 v
- The total energy generated by the piezo panel after boosting = 14 v
- The total energy generated by the three piezo panels connected in parallel = 14 v
- The 12v battery is connected to wireless charger PCB board to charge the mobile battery.

V. CONCLUSION

In this project, we have illustrated the design of the system which generates the electrical energy through the piezoelectric panels installed on the steps. Harvesting the mechanical energy from human movements is an attractive approach to generate the electrical energy. This project holds the key to an uninterrupted way of using smart phones. This project holds the solution to the problem which almost every smart phone user faces. This project has wider range of applications and its generating capacity can be enhanced for various applications.

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