Footstep Power Generation And Wireless Transmission

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Abstract--The demand of electric power is increasing day to day. Different type of power generation methods is existing in our society. This paper proposed an effective power generation technique. In the proposed work, the power generated by footstep are converted to electrical energy through piezoelectric sensor. When a person walks, he loss energy to the floor and that mechanical energy will convert into the electrical energy by the help of the piezoelectric sensor. This paper also proposes the transfer of generated power without wire. WPT (Wireless Power Transmission) is one of the fields that has received good attention in the past decades.

The basic principle of the WPT is the electromagnetic induction. WPT is an extremely useful technology that has numerous applications and benefits. Cell phones, laptops and other mobile devices can be functioned without ever having to be plugged in wireless power even has high potential to solve much of the renewable energy issues.

Index Term – Piezoelectric sensor, LDR Sensor, Inverter

1. INTRODUCTION

Nowadays electricity is a primary want of each day life. Call for of power is growing exponentially each day. In present existence such a lot of technology are used to generate electricity. Therefore, main objective of current technologies is trying to invent and provide a pollutants loose approach of electricity generation. In the complete researchers and innovators working in the area of power harvesting are looking to provide a

non-polluted approach. On this era piezoelectric sensors are used to generate power. Walking is a common activity of a person then the piezoelectric sensors are captured the force applied to the floor and they will convert into electrical signal. Piezoelectric sensors are the material convert any mechanical parameters into the electrical signal.

Piezoelectric materials go about as a transducer and weight applied by the moving individuals changed into electric flow. Other hand in case we are using wireless power transmission circuit an electronic tool perhaps a mobile phone and you want to recharge the battery then you'll probably should get a charger and join the phone to the cord. But what If you may rate it without having to attach it to cord? That means power might be transferred wirelessly. This is possible through a concept referred to as wireless power Transmission. Studies and research were achieved ever because the 19th century but it is only recently that this concept has begun to be implemented. Currently engineers are trying to discover how to increase the efficiency of power transmitted wirelessly and also methods that are safe to human beings and the environment and notwithstanding, methods that are cheaper and hence can be commercially viable. Though still in the early stages, several electronic companies are beginning to roll out devices that can wirelessly transmit power. Wireless power transmission (WPT) is based on the principle of electromagnetic induction. Electromagnetic induction works on the concept of a primary coil generating a predominantly magnetic field and a secondary coil being within that field so a current is induced within its coils. This causes the relatively short range due to the amount of power required to produce an electromagnetic field

II EXPERIMENTAL SETUP AND WORKING

Chapter 1: footstep power generation using microcontroller

Each day the population of the usage increase and the requirement of the power is likewise increase. On the equal time the wastage of energy also increases in many ways. So, reforming this power back to usable form is the major solution. As Technology is developed and the usage of devices, digital devices also increase. Power technology the use of conservative strategies becoming deficiency. 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 on it to a voltage. So, by using this energy

saving method which is the footstep power generation system we are generating power.

This project is used to generate voltage by using footstep force. The proposed system works as a medium to generate power using pressure, force. This task could be very beneficially in public places like bus stands, theaters, railway stations, buying shops, and so on. So, these systems are located in public locations where in human beings stroll and they must travel in this gadget to get through the doorway or exists.

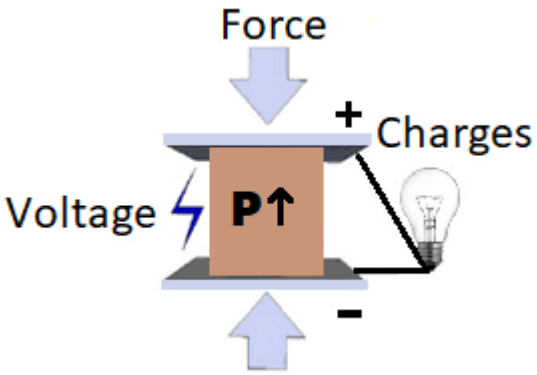

Fig.1.piezoelectric sensor

Then these systems can also generate voltage on each by each step of a foot. For this reason, piezoelectric sensor is used in order to measure force, pressure and acceleration by its change into electric powered signals. This system uses voltmeter for measuring output, led lights, weight measurement device and a battery for higher demonstration of the system.

STEPS

- Whenever force is applied on piezoelectric sensor, then the force is converted into electrical energy.
- In that movement, the output voltage is stored in the battery.
- The output voltage which is generated from the sensor is used to drive DC loads.
- Here we are using Pic16F877A to display the amount of battery get charged.

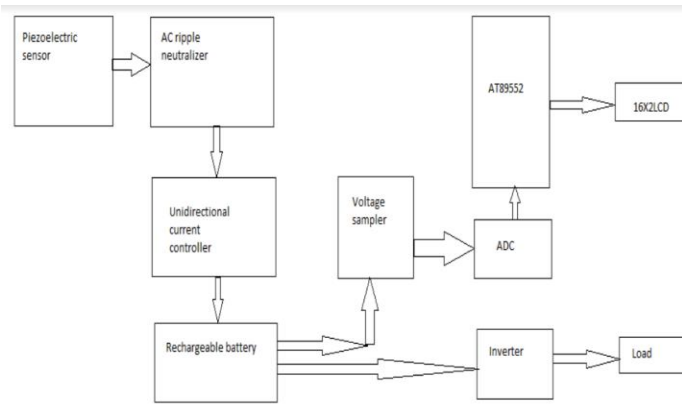

Fig .2. footstep power generation

Chapter 2: Wireless transfer by Inductive Coupling

The general principle of operation turned into designed the usage of inductive Coupling and making sure that the power transfer was as efficiently as possible and the transfer inside the close to field. The layout also ensured for functions of versatility and optimization the battery charging circuit become power efficiency and prevented losses. The circuit become divided into two sections:

1. Transmitter Circuit
2. Receiver Circuit

The transmitter circuit made from the power supply, boost converter, royal oscillator and the copper laminated coils. The receiver aspect had the receiver coil, rectifier, LCD, pic16f877A microcontroller and the switching circuit that used the CD4066. The figure below shows the block diagram of the layout.

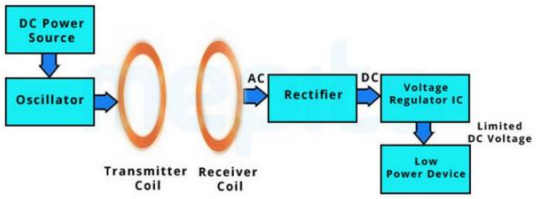

Fig.3.wireless power transmission

AC electricity is supplied from the mains and fed to the power deliver. It's stepped down after which rectified to offer dc electricity. The dc voltage is then passed through the voltage regulator LM7805 so that it will provide a regular 5V dc. This DC signal is however not sufficient to purpose an extensive to create a large emf in order to reason the induction. The 5V is then fed to the dc boost converter to elevate the voltage to 30V. The 30V now will become the input to the royer oscillator circuit. The oscillator then converts the obtained DC voltage to AC power with a high frequency. The MOSFETS cause a large current which is then provided to the transmitting copper coil.

While the receiver coil is placed inside the near area range from the transmitter coil the magnetic field in the transmitter coil extends and it induces an AC voltage which generates a current flow inside the receiver coil of the wireless charger. The transmitted AC voltage is then fed to the rectifier which converts it to DC. A capacitive filter is used to eliminate of any ripples. The rectified voltage is fed to the voltage regulator LM7805 to ensure that the voltage is regulated and steady. The output is regulated 5V dc. This energy then is going to the energy the microcontroller, liquid crystal display and the CD4066 transfer.

III.RESULTS AND DISCUSSIONS

The principle objective of the mission become to develop a device for footstep power generation and wireless power transfer. The device needed to be an electronic circuit. The

achievement of this goal become in addition broken down into precise goals which all together aided the improvement of the tool. The other goals were as follows:

i Design and assemble a power supply unit (footstep power generation): The power supply was to footstep power generation to generated 12v .AC supplied by the mains to 12V ac high frequency. The 12V ac was then to be rectified to give 5V dc.

ii.Step up the dc supply: Using a boost converter, the dc voltage was raised to 30V dc.

iii.Design and assemble an appropriate oscillator: For the project a rover oscillator was found to be most suitable**.**

iv.Develop transmitter and receiver coils: Electromagnetic induction occurs between these two coils and an emf generated on the TX coil that induces a current on the RX coil. The coils were embedded on the fabricated casing of the modules. However, they areas in the figure below.

Fig.4.output of wireless power transmission

V.Designing a battery charging circuit: The transmitted power was to be used to charge a battery so as to further demonstrate the application of footstep power generation and wireless power transmission in the modern world. The figure below illustrates the fabrication of the device.

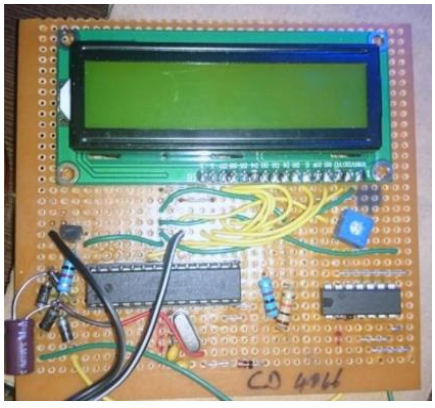

Fig.5.interfacing with microcontroller

III.ANALYSIS AND DISCUSSION

i. Coils: To test if power turned into transmitted, we first soldered an LED to the receiver coil. The check changed into a success with handiest 5V dc powering the oscillator. But the electricity changed into too to energize the battery charging circuit that created from an LCD and microprocessor. The voltage changed into stepped up using a boost converter to 30V dc. Two receiving coils had been used and every had an LED lamp. They both still brightly. We then introduced a hard and fast of LEDs and the effects had been as within the figures below.

Fig.6.transmitter and receiver coils

In the above figure the receiving coils had been no longer separated from the transmitter coil. But as the space of separation increase the brightness reduced. This proved that indeed the distance of separation determines the current induced inside the receiver coil. As distance increases much less current induce from the chance of flux. The check LED bulbs still brightest up to a separation distance of 5cm among the two coils and then their brightness reduced notably. Also, specific gauges of the coil were used to decide which became extra effective. Presently in the market the most common are gauge 26 and gauge sixteen. It changed into mentioned that for the coils of gauge sixteen the space of separation between the coils needed to be shorter and additionally the brightness of the bulb changed into much less than for the gauge 26. Various objects had been located among the receiver and the transmitter coil to check if the defensive might have an impact on the power being transmitted. It became found that this didn't have any good-sized impact on the electricity that turned into transmitted. However, when a magnetic material become, placed in between the coils it had an impact.

ii. Oscillator: The royer oscillator was chosen due to its simplicity but effective design. It is able to producing very high oscillating current which is necessary to increase the strength of the magnetic field. This is completed through the semi-conductor used. In this situation, the IR 540 power MOSFETS. However due to the large current heating passed off inside the MOSFETs thus warmness sinks had been attached to them. When the voltage became stepped as much as 30V dc, upon doing the initial test the transmitter circuit didn't oscillate yet the primary MOSFET changed into unexpectedly heating up. It

became discovered that because of voltage being fed rising too slowly on electricity up a quick circuit came about. To solve this issue, a reset switch was introduced between the electricity deliver and the oscillator circuit. The switch also enabled the circuit to be reset as soon as the MOSFETs heated up. It became additionally located that as lots as the voltage to the oscillator had been stepped up, the energy being obtained at the load coil wasn't enough to electricity the battery charging circuit. This become attributed to the receiver coil being slightly out of resonance accordingly it wasn't able to receive the energy properly. To solve this we ensured that the coils had the same range of turns and the capacitors used had been equal so that both the transmitter and receiver circuits had the equal resonant frequency

iii. Battery Charging Circuit: The battery charging circuit consisted of the rectifier which converted the ac electricity to dc, a pic 16F788A microcontroller, a 16X2 LCD and a CD4066 switch. This part became in large part managed by way of the microcontroller. To start with a relay became used because the transfer once the battery is complete. However, it was drawing extra current and for that reason acted as load. The CD4066 became a better opportunity as it consumed less current and also was much less as compared to the single channel relay. One of the demanding situations with modern chargers is that once charging is complete; there may be no notification to the person to prevent the charging. To solve this; a buzzer was used so that after the charging is complete it sounds. But this meant the enter signal had to be driven on the same frequency as that of the buzzer and additionally it consumes more power. An RGB LED became alternatively used. Its operation turned into coded and loaded to the microcontroller. It was located that, once the battery started charging it closely loaded the rectifier voltage and triggered it to drop appreciably. The battery internal resistance is suspected to be the principal motive of this.

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