Footstep Power Generation System

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***Abstract*- This paper presents an alternative method of power generation with the help of piezo sensors which converts force or pressure applied on it to electric form which is basically piezoelectric effect. This system generates power with the help of piezo sensors and the power generated and number of steps responsible for generating power is displayed on LCD display with help of ATMEGA-328 microcontroller. Power generation and its use is one of the issues. Now-a day's numbers of power sources are present, non-renewable & renewable, but still we can't overcome our power needs. Among these human population is one of the resources. We are doing generation of power by walking or running. The generated power will be stored and then we can use it for domestic purpose. This system can be installed at homes, schools, colleges, where the people move around the clock. When people walk on the steps or that of platform, power is generated by using weight of person. The control mechanism carries piezoelectric sensor, this mechanical energy applied on the crystal is converted into electrical energy when there is some vibrations, stress or straining force exerted by foot on flat platform.**

***Index terms*- Piezo sensors, Piezoelectric effect, ATMEGA-328, LCD display**

I.INTRODUCTION

For an alternate method to generate electricity there are number of methods by which electricity can be produced, out if such methods footstep energy generation can be an effective method to generate electricity. Walking is the most common activity in human life. When a person walks, he loses energy to the road surface in the form of impact, vibration, sound etc, due to the transfer of his weight on to the road surface, through foot falls on the ground during every step. 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 mobility of its masses will turn into boon in generating electricity from its footsteps. This energy can be tapped and converted in the usable form such as in electrical form. This device, if embedded in the footpath, can convert foot impact energy into electrical form. Greater movement of people will generate more energy. In this topic 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 for our nation.

II. RELATED WORK

Non-conventional energy using foot step is converting mechanical energy into the electrical energy. This project uses piezoelectric sensor. This project shows the conversion of the force energy into 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. 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. The LCD is interfaced with the microcontroller ATMEGA328P for programming purpose. The battery charger is connected to Microcontroller ATMEGA328P to display on LCD that the battery is getting charged. The 5V power supply is given to the microcontroller and the LCD. In this project we are also using ATMEGA382P microcontroller for displaying the amount of battery charged when pressure is applied to piezoelectric sensor. We can say the amount of pressure generated by footsteps is being displayed as well as the number of steps generating power will also be displayed.

III. SYSTEM OVERVIEW

Hardware Required

1. Piezoelectric Sensor

A piezoelectric sensor is a device that uses the piezoelectric effect to measure pressure, acceleration, strain or force by converting them to electrical signal.

Figure : Piezo Electric Sensor

2. ATMEGA328

After considering the size of the code and the internal architecture requirements, an ATMEGA328 microcontroller has been chosen. It is an 8-bit microcontroller and belongs to Atmel's 8052 family.

Figure: ATMEGA328 IC

3. Voltage regulator

A voltage regulator is an electrical regulator designed to automatically maintain a constant voltage level. In this project, power supply of 5V and 12V are required.

Figure : 7805 Voltage Regulator

4. Unidirectional Current Controller

After considering the size of the code and the internal architecture requirements, an ATMEGA328 microcontroller has been chosen. It is an 8-bit microcontroller and belongs to Atmel's 8052 family.

5. Rectifier

The output from the transformer is fed to the rectifier. It converts A.C. into pulsating D.C. The rectifier may be a half wave or a full wave rectifier. In this project, a bridge rectifier is used because of its merits like good stability and full wave rectification.

6. Battery

Battery (electricity), an array of electrochemical cells for electricity storage, either individually linked or individually linked and housed in a single unit. An electrical battery is a combination of one or more electrochemical cells, used to convert stored chemical energy into electrical energy

7. LCD Display

A liquid-crystal display (LCD) is a flat-panel display or other electronically modulated optical device that uses the light-modulating properties of liquid crystals. Liquid crystals do not emit light directly, instead using a backlight or reflector to produce images in color or monochrome.

Figure: LCD Display

8. Capacitive Filter

Capacitive filter is used in this project. It removes the ripples from the output of rectifier and smoothens the D.C. Output received from this filter is constant until the mains voltage and load is maintained constant. However, if either of the two is varied, D.C. voltage received at this point changes. Therefore a regulator is applied at the output stage.

Software Used : Arduino Software(IDE)

IV. METHODOLOGY

Non-conventional energy using foot step is converting mechanical energy into the electrical energy. This project uses piezoelectric sensor. This project shows the conversion of the force energy into electrical energy. An arrangement piezoelectric sensor is made which generates voltage across the arrangement which is supplied to a bridge rectifier circuit to obtain DC voltage and given to a rechargeable battery and thus the battery gets charged. The battery used here is a Lead Acid Battery of 6V. A LCD is interfaced with microcontroller. The microcontroller used here is ATMEGA 328P which is 8-bit, 32 kb flash with 1k RAM and has 16MHz speed. The 16 x 2 LCD is used to display the voltage generated by the piezo-electric sensor arrangement and will also display number of footsteps generating power. The power supply unit is used to supply power to microcontroller and LCD.

V. RESULT

Figure : Footstep Power Generation System

Thus we can see that with the help of this system we are able to generate power with the help of footsteps when pressure is exerted on the piezoelectric sensors and the voltage generated by the applied pressure on the sensors as well as the number of steps which are responsible for generation of power is being displayed on the 16*2 LCD.

CASE I : When no pressure is applied on the piezoelectric sensors the voltage generated is 0V and the same in displayed in the 16*2 LCD Display. So we can see in the given figure that initial reading of voltage generated by piezoelectric sensors and the step count value ia 0.

FIGURE: Initial reading on the display when no pressure is applied on the piezo sensors

CASE II: When pressure is applied on the piezoelectric sensors on the piezoelectric sensors we can observe that amount of voltage generated because of the pressure applied on the sensors is being displayed on the 16*2 LCD and the number of footsteps responsible for generating the value is also displayed.

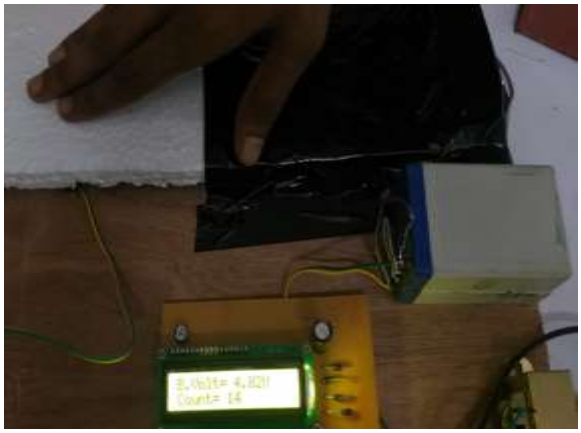

FIGURE: Voltage value and step count displayed when pressure is applied on the piezo sensors

VI. CONCLUSION

The objective of this proposed system was to come up with some alternate or a non-conventional source of energy to fulfill the energy requirement is a different way that is with the help of human footsteps and we can observe from the outcomes that we are able to generate power with the help of human footsteps .The project “footstep power generation system” is successfully tested 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 absence. As India is a developing country where energy management is a big challenge for huge population. By using this project we come up with an alternate method of power generation with the help of human footsteps.

In future aspects we can use this principal in the speed breakers at high ways where are rushes of the vehicles too much thus increases input torque and ultimate output of generator. If we are used this principle at very busy stairs palace then we produce efficient useful electrical for large purposes. In India, maximum public movement is in railway stations, temples, and shopping malls. Hence these places can be used for generation for electric power with the help of piezoelectric sensors. Apart from all above places we can also develop energy from our daily life by initialising piezoelectric crystals in shoe thus in each step piezoelectric crystal is compressed which can turn enough power to charge small electronic gadgets.

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