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Generation of Electricity Using Piezoelectric Crystal

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ABSTRACT: Step as a source of energy that can be obtained while walking on the certain arrangements like stairs, footpaths, platforms, runways and these systems can be installed elsewhere. Specially in the dense populated areas. The purpose of this PPT is to provide a solid explanation for the generation of reliable amount of power by using conversion of mechanical energy into electrical energy using piezoelectric materials The aim is to find a suitable & efficient source of electrical energy by using our surrounding, Through this technique we can generate free electricity One of the most suitable methods for obtaining the energy from footsteps is by using piezoelectric crystals. Piezoelectric crystals are one of small scale energy sources. A future of electricity generation cannot be fully depends on the fossil fuel and conventional energy sources. As this sources are depleting day by day to solution for this problem is using non-conventional energy sources. In India there is 80% fuel is imported from foreign gulf countries.

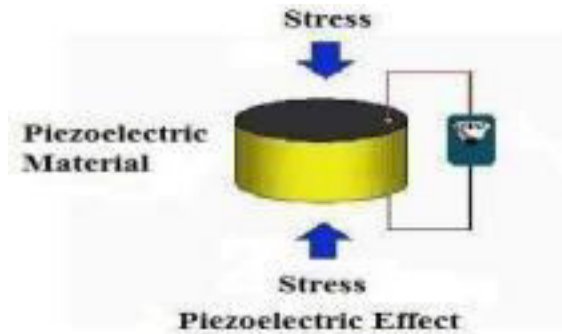
KEYWORDS: Piezoelectric, Piezoelectricity, Energy.

I.INTRODUCTION

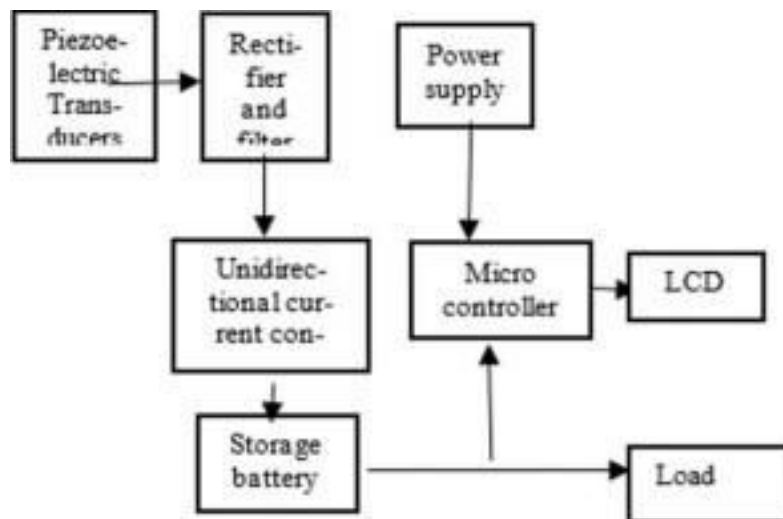
Electricity is a basic need of human life and the demand of electricity is increases. Traditional methods such as burning of coal, wood, diesel (generators) etc cause pollution as well as continuously depleting our natural resources such as fossil fuels. Mostly the electricity is generated by using the Generation of electricity burning of fossil fuels or the of atoms, but this type of methods increases the pollution. The effect of this pollution increases the Global warming. There are many energy sources, which are not harmful to nature like Solar, Wind Power, Tides, and Hydroelectric. Footstep power generation system is new growing technology for power generation, the 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 losses 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.This energy can be converted into the usable form such as in electrical form. This device, if embedded in the footpath can convert foot impact energy into electrical form.

II. PIEZOELECTRIC MATERIAL AND ORIGIN

The word piezoelectric taken from the Greek word „piezo“ which means to press. Piezoelectric materials are the material which has natural ability to generate an electrical energy in response to applied mechanical stress. This effect can done vice versa means mechanical vibration can be made up from applying electrical potential across it. This phenomenon is known as piezoelectricity or piezoelectric effect.[1]



III. BLOCK DIAGRAM



IV. SYSTEM DEVOLPMENT

The project made by us is named as the footstep power generation using piezoelectric sensor. This project consists of components such as piezoelectric sensor, ARDINO UNO, LCD, battery, LED, bridge rectifier, rubber mat and connecting wires. This project generates electricity for emergency cases. The stepping of the human at any place where we have the foot step power generation, while the step the energy or the force is being provided. It consists of piezoelectric sensors under the rubber mat. When the step is provided the piezo converts the mechanical charge into electrical charge this is the basic principle of piezoelectric sensor. Where it first stores the mechanical energy and converts the energy into electrical energy. Then the electrical charge created is then provided to bride rectifier. Bridge rectifier is usually used for the conversion of AC current to DC current. As we needed to get the output present in the form of blinking of the led, for glow of LED.

V. LITERATURE REVIEW

A future of electricity generation cannot be fully depends on the fossil fuel and conventional energy sources. As this sources are depleting day by day to solution for this problem is using non-conventional energy sources. In India there is 80% fuel is imported from foreign gulf countries. Which is spending 150 billion US dollar yearly [6] and also recently India promises to increase the share of non-conventional energy source up to 40% by2030 [6]. To achieve this India have to move from conventional to non-conventional energy sources. There is a hidden non-conventional energy source so far that is piezoelectricity. This can be develop a new area in electricity generation .this can be achieve by piezoelectric materials. This material converts a mechanical energy to electrical energy proportionally and efficiently.



VI. DESCRIPTION OF COMPONENTS PIEZOELECTRIC SENSOR

The piezo electric sensor is a device that uses the piezo electric effect to measure changes in pressure, acceleration, temperature strain or force by converting them to an electrical charge. The prefix piezo is Greek word for press or squeeze. Piezoelectric material is mainly categorized in two type's namely piezoelectric ceramics and single crystal materials. Piezoelectric are also known as PZT ceramic (Lead Zerconate Titanate). The piezo element that is being used is disc shaped piezo element. The reason behind this disc shaped piezo element is as it tends bent very easily. It creates AC current through the use of foot stepping. The energy created by this sensor gives the generated current to the bridge rectifier.

BRIDGE RECTIFIER:

Bridge rectifier is basically a converter which converts AC current to DC current. It means that it reactifies AC input to DC output. This is widely used in power supplies that provide necessary DC voltage for the electronic components and devices. It consists of four diodes or more. Depending on the load current requirements, a proper bridge rectifier is selected. Components rating and specifications, breakdown voltage, temperature ranges, transient current rating, forward current rating, mounting current requirements and other consideration taken into account while selecting rectifier power supply for an appropriate electronic circuit application. As the output of the piezoelectric sensor is an alternating current (AC) we have used bridge rectifier to convert the alternating current into direct current. The purpose for the conversion of the current is to make the LED glow.

IR SENSOR

IR sensor is also known as infrared sensor. It basically senses the surrounding and detects the motion of the object or anything else. Infrared sensor is widely used in electronic field. These sensors are used for the humans infeasible sensing. Active and passive are the two types of infrared sensor. Emitting and detecting infrared radiation is carried in active sensor while in passive sensor only emitting is done. Infrared sensor basically works on three principles or laws namely Planck's radiation, Stephan Boltzmann law, and Wien's displacement law. The radiation that is given out by the piezoelectric sensor are detected by the infrared sensors.

ARDUINO UNO

ARDUINO Uno has digital and analog input and output pins. Out of which 14 are digital input /output pins and 6 are analog input /output pins. Following are the some of technical specifications of ARDUINO such as it is a microcontroller board on microchip AT mega328P, it's operating voltage is 5 volts, input voltage provided to the ARDUINO is between 7 to 20 volts, the DC current per input /output pins is 20 Ma, ARDUINO has the clock speed of 16MHz. The special pins operating on ARDUINO are serial/UART, external interrupts, PWM, SPI, TWI and AREF.IDE (Integrated Development Environment) is a software that is used for the ARDUINO. In real world by using ARDUINO we can control and sense the external





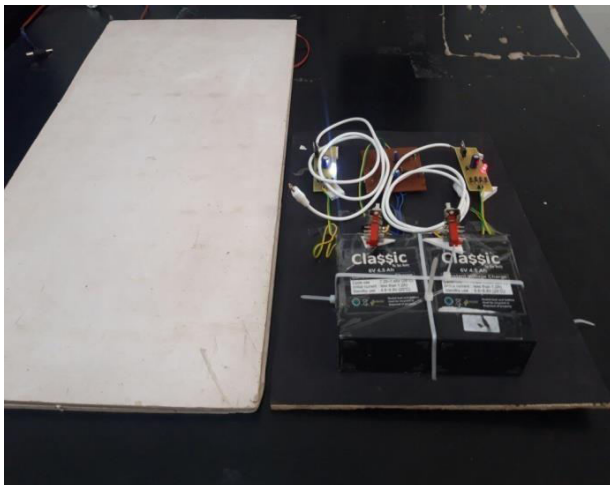
VII. APPLICATION

- 1) Convention machine.
- 2) The active and passive vibration are carried out
- 3) Footpaths
- 4) Wind Power Plants
- 5) Railway
- 6) Subways

VIII. FUTURE STUDY

future plan is to build a practically working model using this concept. That have planned about making a piezoelectric crystal. Later, we will carry out a study of a variety of piezoelectric crystals, and make a comparison between them, so that we get the best performing crystal. Using this pizo crystal, we will design a circuit or a project, which will harness the output of this piezo crystal.

IX. RESULT



Hence when the crystals are pressed under a certain pressure it generate a small amount of electricity. In concluding the words of the project, since the power generation using footstep get its energy requirements from the non-renewable source of energy. There is no need for power from the mains and there is less pollution in this source of energy. It is very useful to places such as roads crowded areas etc. It will be able to extend this project by using the same arrangement and construct in the footsteps/ speed breakers so that it will increase the Power production rate, and hence beneficial for mankind years to come.

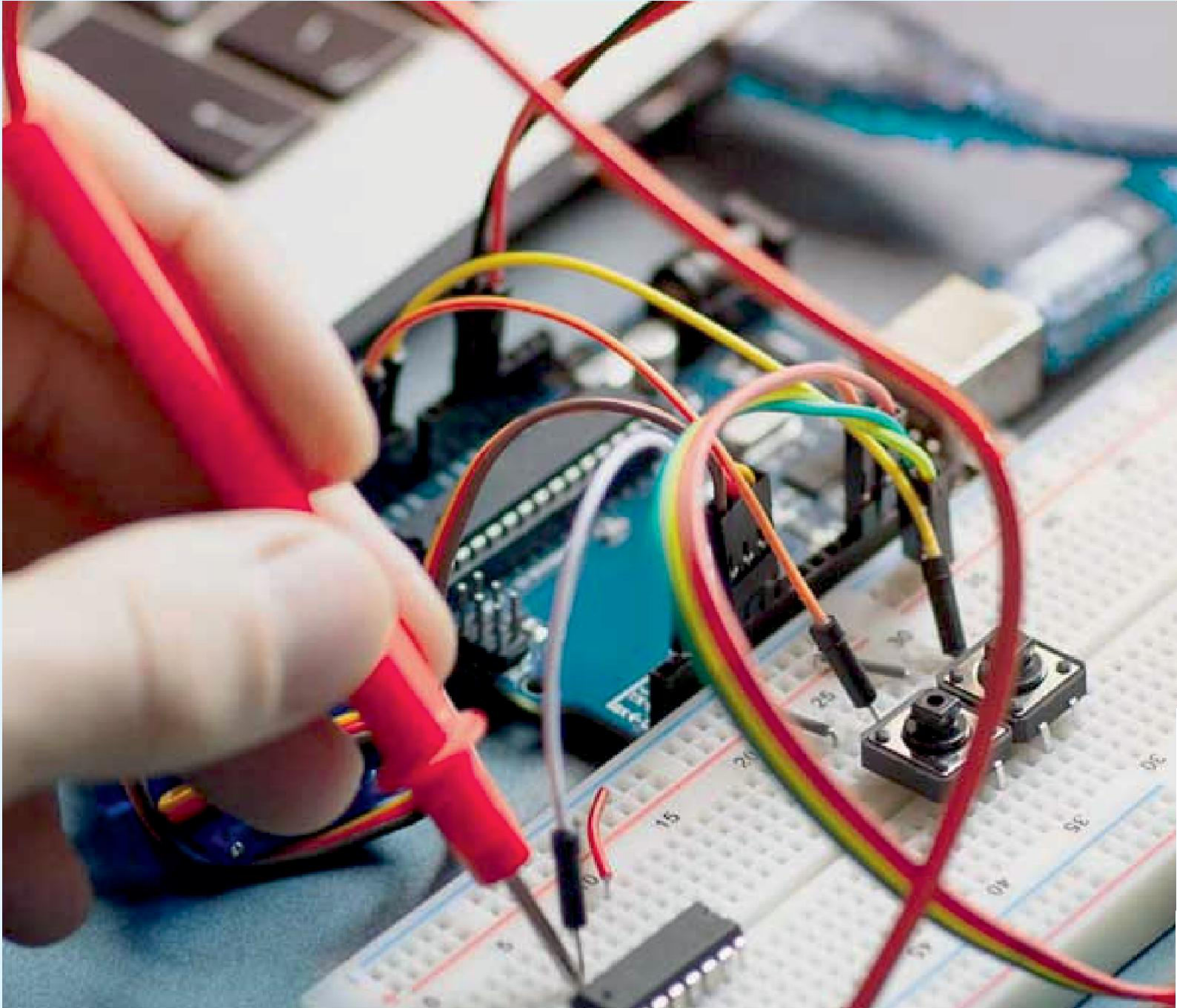


X. CONCLUSION

In this project, by using piezoelectric crystal we have developed footstep power generation and it is successfully tested and implemented which is the best economical and affordable energy source to everyone in our society. Developing a project like this in huge populated countries like India and China where energy source is a very big problem in our day to day life. Due to these problems we have made this project to overcome the problem in emergency cases From this micro-project of generating electricity by using piezo electricity for economic operation we conclude that: The piezoelectric transducer is available in desired shape. It has rugged construction. It is small in size. It has good frequency response. It has negligible phase shift.

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