

Electricity Generating Shoes

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Abstract: The "PIEZOELECTRIC SENSOR", which on applying a pressure will generate power^[1,2]. Using that sensor along with other electronic circuitry we'll make a system that fits under the sole of your shoes while you walk, your feet applies some pressure on the sensor in return the sensor produces power which can either be used instantly or can be stored in a battery. This system of ours can also be used in the areas like railway station where the crowd is so huge. We can implant the same sensor and system under the stairs of the bridge people uses to cross one platform to the other. In this case power generation is large enough to light up the whole station.

I. Introduction

Power Generation is the area of the project. It is the process of generating electric power from primary energy sources.

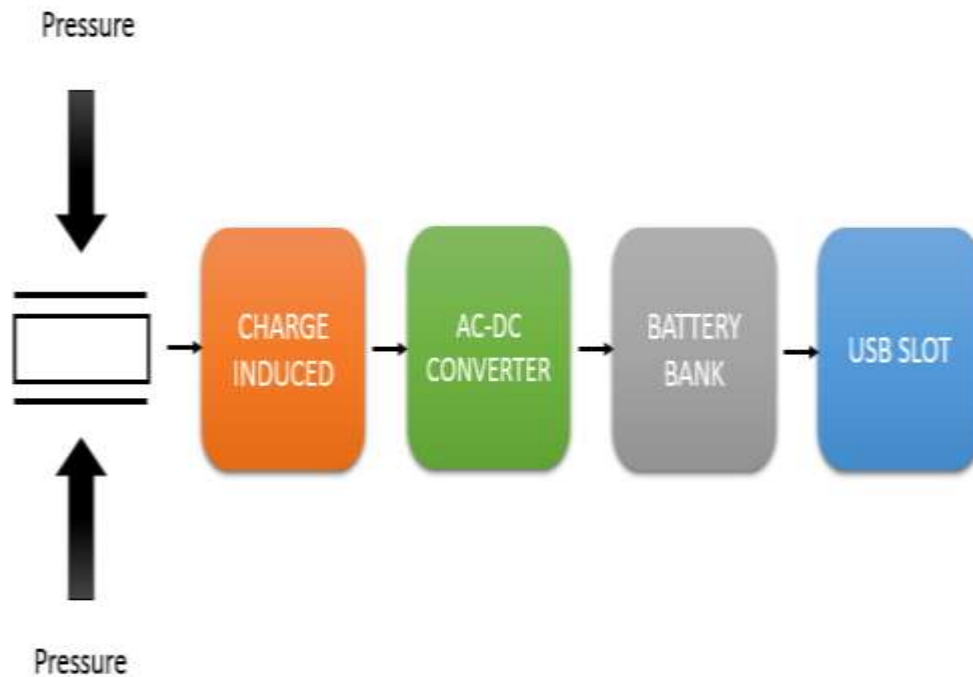
A characteristic of electricity is, that it is not freely present in the nature in remarkable amount and it must be produced.

Production is carried out at power plant by electromechanical generators. Primarily driven by heat engines, kinetic energy of flowing wind and water which is abundant in nature^[3].

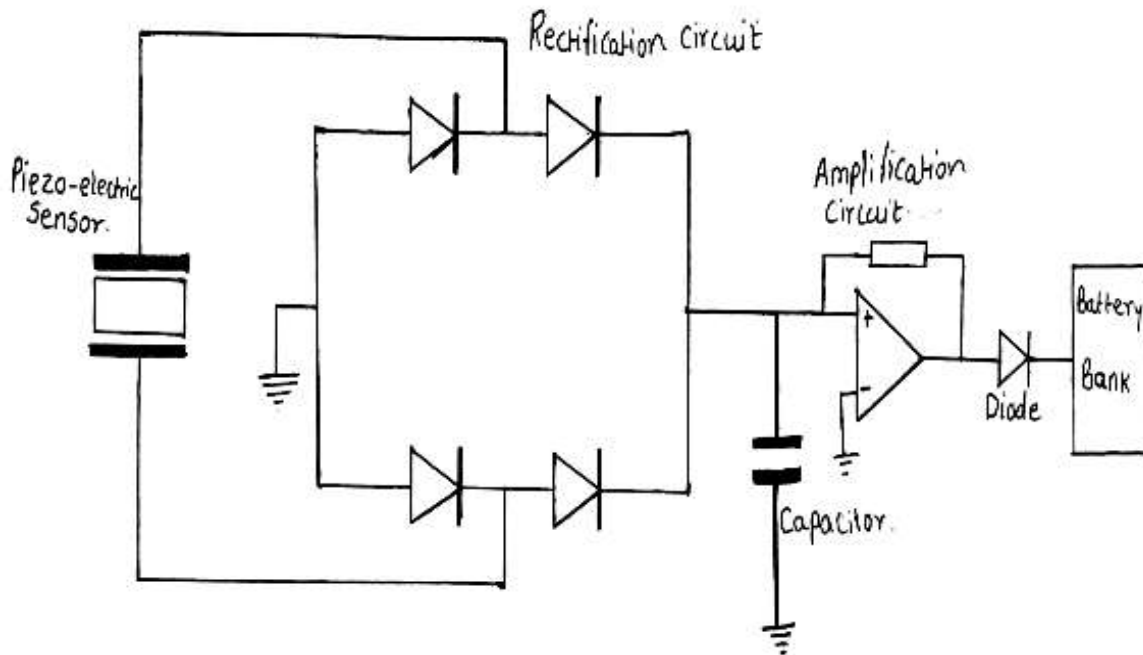
The basic principle behind the project is Piezoelectric Effect. *Piezoelectric effect*: when a substance is subjected to mechanical stresses or change in force on the body there is charge induced on it. When a person walks the force is exerted on the ground due to body weight, in turn, by Newton's third law, the opposite reaction force is applied by the surface^[1,2,5].

The forces are applied on the piezoelectric material. These changes in forces on the piezoelectric material causes charge induction. This charge induction causes induced electro-motive force which charges the battery.

II. Block diagram



III. Circuit Diagram :



IV. Hardware Requirement

Piezoelectric Plate: We can use piezoelectric material of any kind but in plate shape. As it serves the general purpose of generating electricity under application of external force, which in our case would be weight of the body. Here we can use circular piezo-plate of 40mm for heel section and 20mm for rest of the sole.

Diodes: Here Diode is used to stable the voltage that coming through piezo plate And to stop the reverse flow of charge.

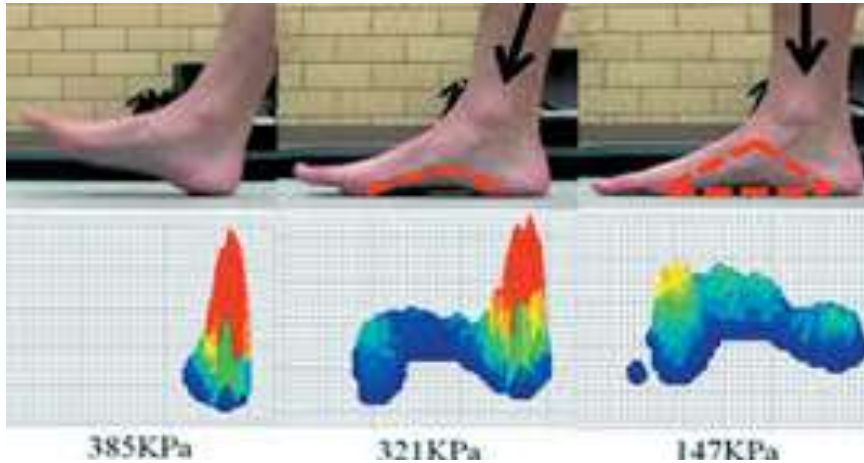
Capacitor: It is used to remove the ripples from the voltage which produced by the piezo plate.

Rectifier: The piezo-plate generates AC output which needs to be converted into DC before reaching the batteries for the charge storage. Hence we used a rectifier

Lithium Ion Battery:The energy which is generated by the piezo-plate needs to be stored in an energy storage device. Lithium-ion Battery serves this purpose. A battery is used in which the energy converted from the pressure applied by the feet is stored. And whenever the energy is required it can be supplied from battery.

V. Pressure Distribution

The variations in pressure applied while walking in one complete walking cycle From heel striking the ground (maximum pressure point) to lifting the toe off the ground (minimum pressure point)^[1,2,4].



The equation governing the pressure to current conversion is as follows^[1,2]:

$$V_{\text{generated}} = P_{\text{app}} * T_p * C$$

Where, P_{app} = Pressure applied on piezo

T_p = Thickness of the piezo

C = piezo rating

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