JETIR.ORG ISSN: 2349-5162 | ESTD Year : 2014 | Monthly Issue
JOURNAL OF EMERGING TECHNOLOGIES AND INNOVATIVE RESEARCH (JETIR)
An International Scholarly Open Access, Peer-reviewed, Refereed Journal

Sound Energy to Electrical Energy Conversion: An Experimental Study

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Abstract: Noise pollution is prevalent in developing economies from sources like car parks, residential areas, and celebrations. This project aims to convert sound energy into electrical energy using sound sensors. The system captures sound signals, converts them into electrical energy, and stores it for future use, also indicating noise levels in an area. This sustainable energy source could be particularly useful in high-noise areas like airports, industries, and traffic junctions. It presents an alternative to conventional energy sources such as solar and wind power.

Keywords: Conversion, Electricity, Noise pollution.

I. INTRODUCTION

Electricity is essential in daily life, and a lack of it can disrupt many activities. Due to the high demand for electricity, various methods are employed to generate it. However, relying heavily on conventional electricity can be risky, necessitating alternative sources. Innovative methods of generating electricity are valuable, aligning with the law of conservation of energy, which states that energy can neither be created nor destroyed. Ecological energy sources have been discovered and implemented to address energy shortages. Sound transducers, such as microphones and loudspeakers, convert sound into electrical energy. Other transducers, like piezoelectric devices, hydrophones, and sonar transducers, detect high frequencies and underwater sounds. This project utilizes speakers to convert sound energy into electrical energy.

II. LITERATURE REVIEW

We could convert sound energy into heat energy as the sound wave propagates through the oscillation of the medium particles, so when the sound energy passes through the medium, it disturbs the medium particle, this disturbance caused by the sound will be used to convert into heat energy. when the particles of the medium are pushed by the sound wave, they will collide with the neighboring particle of the medium this collision will result in the production of heat energy, the production of heat energy will be more in a denser medium, so for more heat production we will need a material with a very high density. This thermal energy is converted into electricity. This method is less efficient because more energy is lost in converting sound energy to heat energy and then heat energy to electrical energy than other methods. Here the transformation is done by a double loss of energy. So in converting sound energy to heat energy there will be some loss of sound energy because some of the sound energy would be converted to another form and in the conversion from heat energy to electrical energy not all the energy would be converted to electrical energy. the heat energy would be converted into another form of energy.

III. PROBLEM FORMULATION

The process initiates when sound waves collide with a speaker, causing it to vibrate and thereby produce electrical signals. These signals, initially in an alternating current (AC) form, are then transformed into direct current (DC) by a bridge rectifier. To increase the voltage to a level appropriate for charging, a voltage boost module steps up the DC voltage. The enhanced voltage is subsequently managed by a TP4056 charging module, which oversees the charging process to ensure it is both safe and efficient. Once the battery is fully charged, it can either power various devices immediately or store the energy for future use, effectively converting ambient sound into a practical energy.

IV. CIRCUIT DIAGRAM

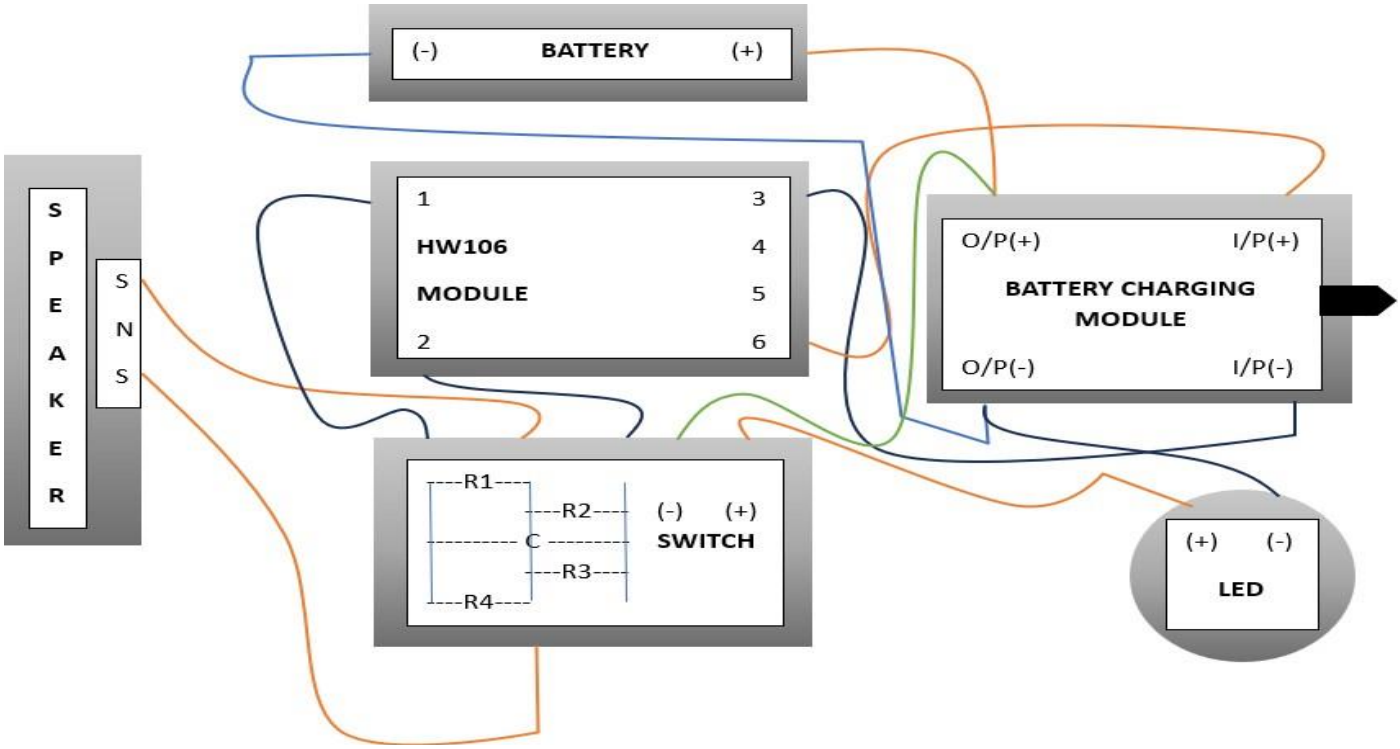

Figure 1: Circuit Diagram

V. COMPONENTS

5.1 Components Used

SL NO	COMPONENT NAME
1.	Speaker
2.	LED Lights
3.	18650 Rechargeable Battery
4.	On/Off Switch
5.	Wires
6.	TP4056 Batter Charging Module
7.	Resistors
8.	Capacitors
9.	Bridge Rectifier
10.	Voltage Booster Module

VI. CONCLUSION

Sound energy is an untapped resource with significant potential to meet future electricity demands and provide a renewable, eco-friendly energy source. Although not yet practically efficient, ongoing research makes this technology promising. By utilizing the piezoelectric effect, sound can be converted into electrical energy. Since sound is ubiquitous, it offers a sustainable electricity generation method. The amount of electricity generated depends on sound decibels and receiving diodes. With electricity demand projected to increase by 40% by 2040, sound transducers could significantly impact daily life.

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