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S.M.A.R.T Generator

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Abstract: ***The project helps to design a device that can be used as a replacement of conventional non-renewable energy sources by non-conventional renewable energy sources, so that usage of fossil fuel will be reduced. .Production of green energy from unattended energy loss. Benefitting the government by reducing the power consumption produced in power stations. Using the noise (sound energy) produced from the working machines and environmental sound.***
Keywords: Battery, Ladder Circuit, Diaphram, Piezoelectric circuit

I. INTRODUCTION

A. Need

This device uses renewable resource as its major power source, in other words a form of pollution (noise) is converted into electrical signals which can be used to generate power. Here we use simple lab materials which are easily available. All other renewable resources require a system which should be installed and occupy large amount area, but in this project the system is so small, which can be carried with ourselves. As this device does not require a system, it does not give any unwanted by product.

B. Market Survey

Project working on the basis of oscillation created by the sound wave which can be further converted to electricity and as the frequency is high the movement will be fast due to it we will get appreciable amount of electric energy. It uses loudspeaker (transducer) to work opposite as of its normal working i.e. instead of converting electrical signal into sound it converts sound wave into electrical.

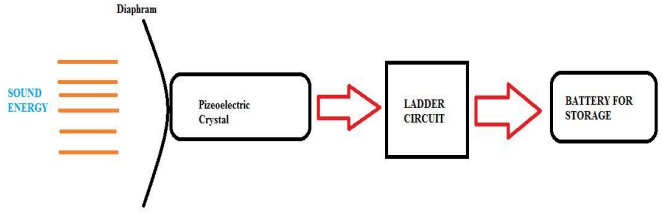
C. Innovation

Conversion of noise into electrical energy is followed in this method indirectly. The piezoelectric transducer deforms due to the vibration produced from the noise. This technique gives power which can replace the consumption of non-renewable energy for smaller usage. Though, the device is small in size it takes up the vibration produced in the surrounding (vibration due to the noise in the surrounding as sound requires medium to travel) and produce electrical signals which can be amplified.

Condenser microphones require power from a battery or external source. The resulting audio signal is stronger signal than that from a dynamic. Condensers also tend to be more sensitive and responsive than dynamics, making them well-suited to capturing subtle nuances in a sound. They are not ideal for high-volume work, as their sensitivity makes them prone to distort. It acquires the noise/sound from its environment and converts it into vibration pulses which are sent to the piezoelectric transducer.

Piezoelectric transducers are common in ultrasonic applications, such as intrusion detectors and alarms. Piezoelectric devices are employed at AF (audio frequencies) as pickups, microphones, earphones, beepers, and buzzers. Here it absorbs the vibration (stress) and deforms. This deformation in the piezoelectric produces flow of charges (current) which is transferred through wires to reach the amplifier, where it current passes through a diode to make it certain that current does not flow in the reverse direction and cause damage to the device. After the current is amplified and conditioned, it is stored in a capacitor where the charges are held for later use.

Block diagram



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II. DESIGN

The energy source is abundantly available in the surroundings. Sound from the environment is gathered by the condenser microphone (Fig 1.1) which is then converted into electrical signals and sent to the piezoelectric transducer.

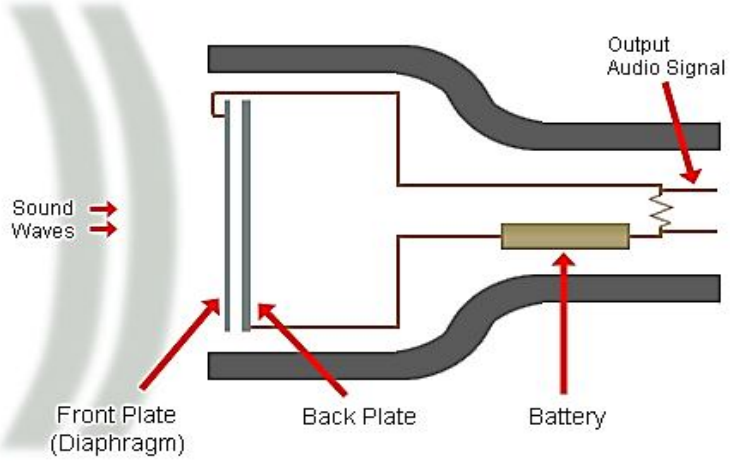

Fig 1.1

The vibration produced from the sound as well as the moving machines due to friction is accepted by the piezoelectric transducer (Fig 1.2) so that both piezoelectric effect and inverse piezoelectric effect take place within the device.

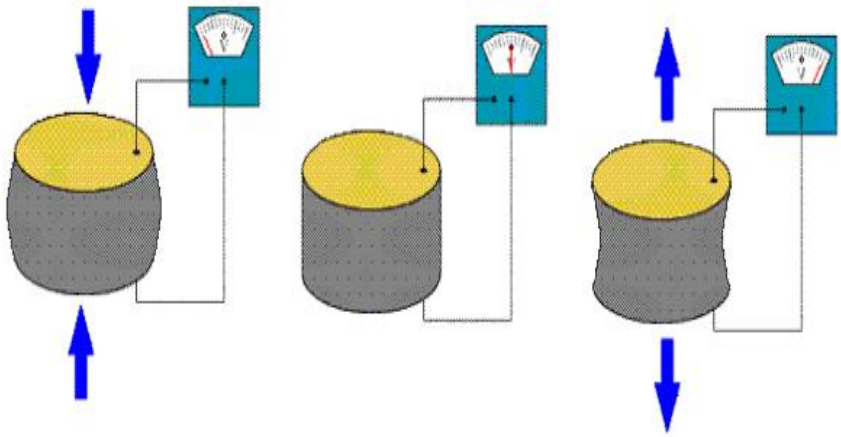

Fig 1.2

As a result the vibration produced is converted into electrical pulses (current) which can be put to better utilization and power loss management is met out.

III. HARDWARE

A. Condenser microphone:

Condenser means capacitor, an electronic component which stores energy in the form of an electrostatic field. The term condenser is actually obsolete but has stuck as the name for this type of microphone, which uses a capacitor to convert acoustical energy into electrical energy.

Condenser microphones require power from a battery or external source. The resulting audio signal is stronger signal than that from a dynamic. Condensers also tend to be more sensitive and responsive than dynamics, making them well-suited to capturing subtle nuances in a sound. They are not ideal for high-volume work, as their sensitivity makes them prone to distort.

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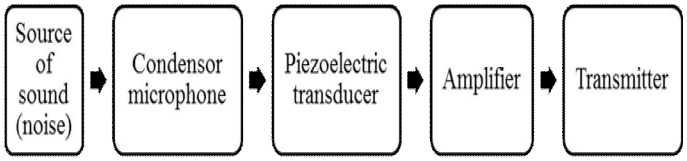


B. Piezoelectric transducer

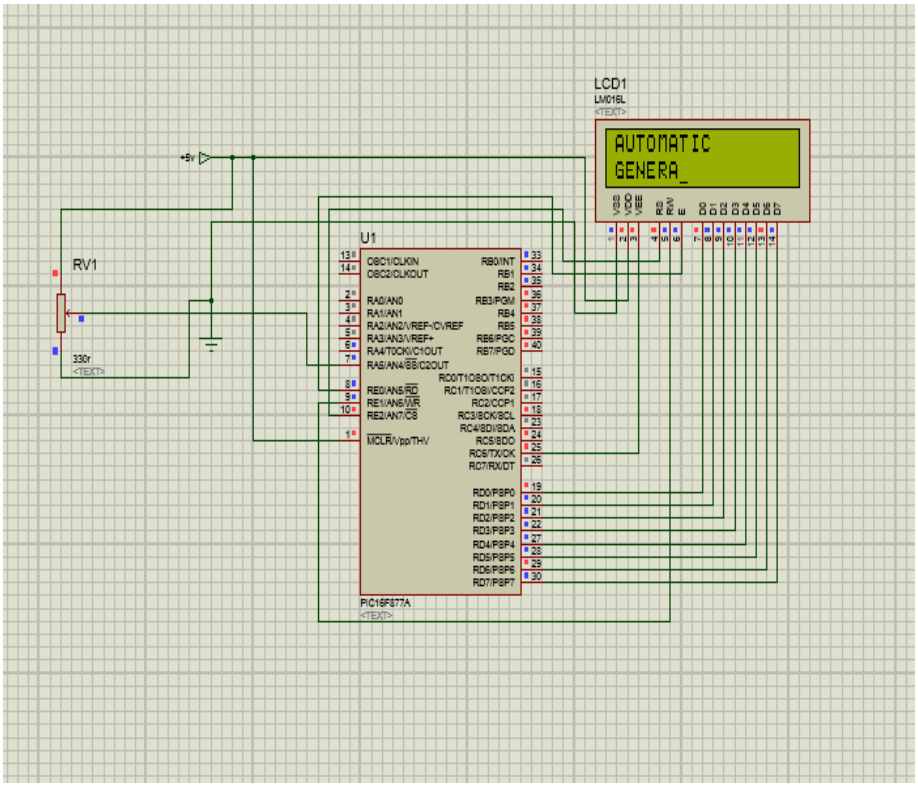
A piezoelectric transducer comprises a "crystal" sandwiched between two metal plates. When a sound wave strikes one or both of the plates, the plates vibrate. The crystal picks up this vibration, which it translates into a weak AC voltage. Therefore, an AC voltage arises between the two metal plates, with a waveform similar to that of the sound waves. Conversely, if an AC signal is applied to the plates, it causes the crystal to vibrate in sync with the signal voltage. As a result, the metal plates vibrate also, producing an acoustic disturbance.

Piezoelectric transducers are common in ultrasonic applications, such as intrusion detectors and alarms. Piezoelectric devices are employed at AF (audio frequencies) as pickups, microphones, earphones, beepers, and buzzers. In wireless applications, piezoelectricity makes it possible to use crystals and ceramics as oscillators that generate predictable and stable signals at RF (radio frequencies).

IV. SOFTWARE

A. Proteus 8.0 professional

It is a simulation software used to test the circuits and output is viewed visually. Highly complicated circuits are easy to test using this software.



FLOWCHART

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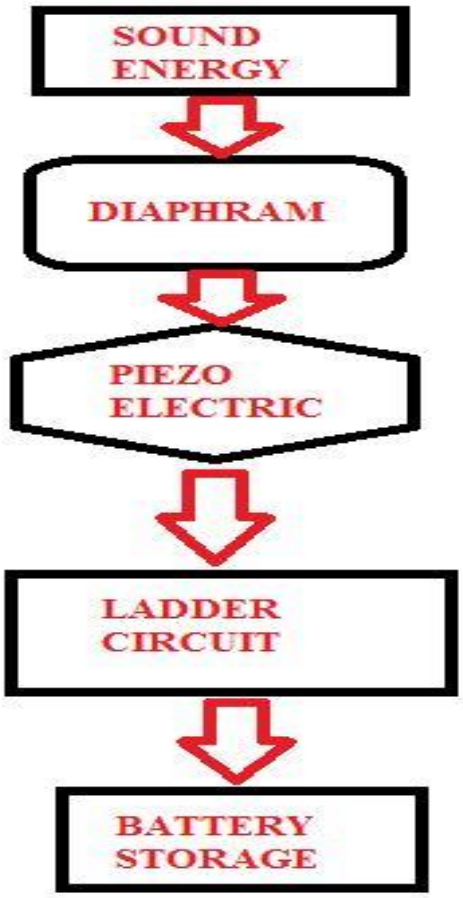

V. ADVANTAGES

A. This device is cost efficient as the components used here are simple lab components which are easily available.
B. The usage of piezoelectric transducer depicts the path of impact of sensors which is highly profitable and energy efficient.
C. It does not cause any pollution as it uses renewable energy source and installation of the system is very trouble-free.
D. The power system required for the driving of the system is same as the driven parameter-sound. Hence the device is an active transducer device.

VI. LIMITATIONS

A. Cost of Piezoelectric crystal is costly I should be handled with care.

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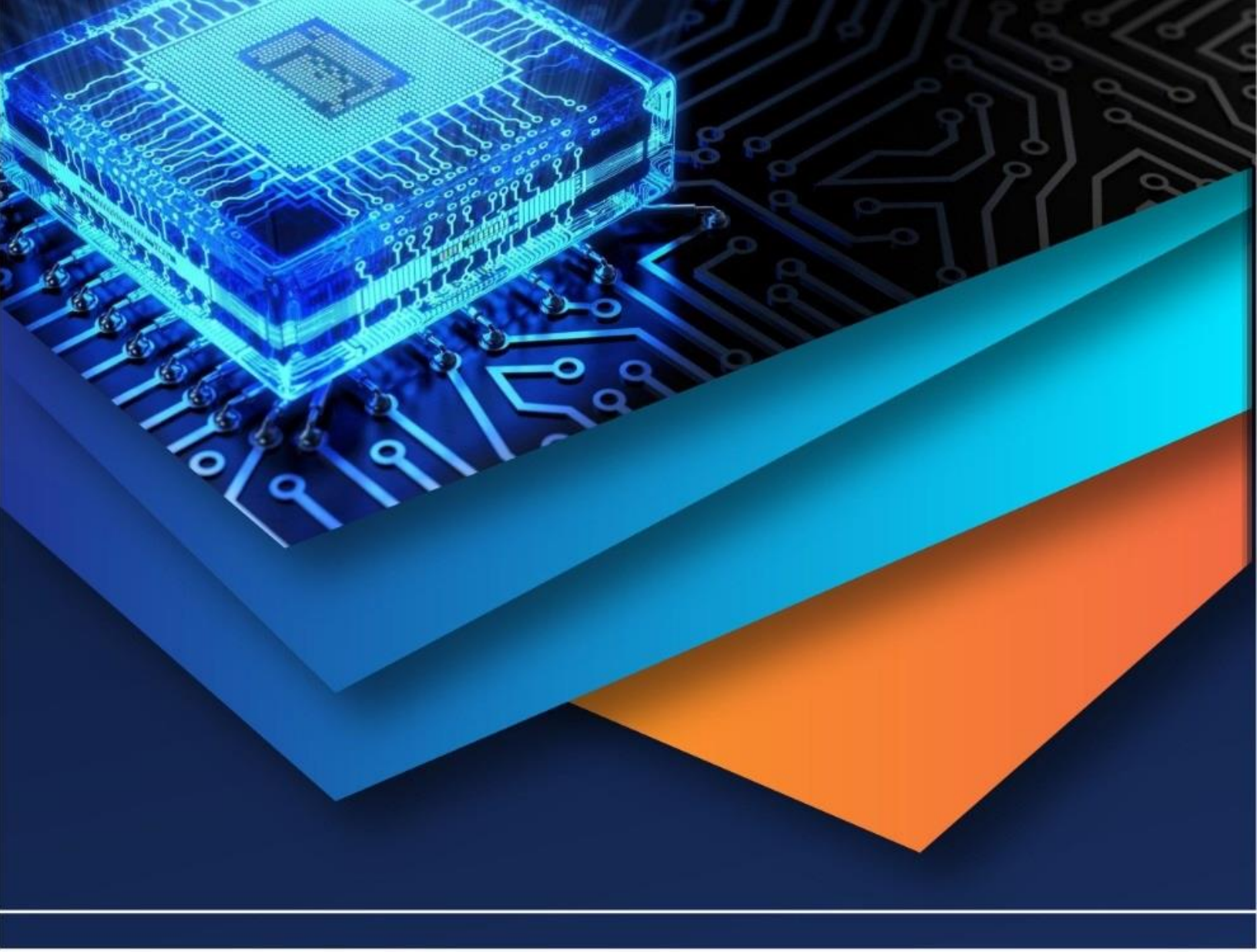

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