

CHARGING MOBILE PHONE BY MAKING USE OF SOUND

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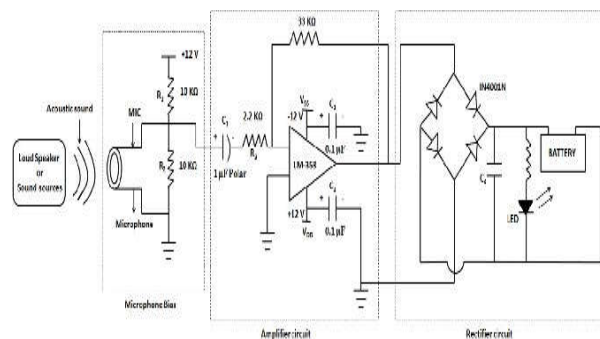
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Abstract - This paper describes charging of mobile phones by making use of sound . basically here the sound energy is converted into electrical energy , the main principle involved in this project is piezoelectric effect which is the conversion of mechanical force or stress into electrical energy. The technology uses tiny strands of zinc oxide sandwiched between two electrodes. A sound absorbing pad is placed on the top of the sandwiched zinc oxide electrodes. Sound absorbing pad on top vibrates when sound waves generated, hit the sound absorbing pad. This results in the tiny zinc oxide wires to compress and release. The compressions and rare fractions are due to the sensitivity of the ZnO. A nano generator is placed between the sandwiched zinc oxide electrodes. The compressions and rare fractions are given to the nano generator. The nanogenerator converts the given mechanical energy into electrical energy. The generated electrical energy is used to charge the battery.

I. INTRODUCTION

This paper describes charging of mobile phones by making use of sound . basically here the sound energy is converted into electrical energy , the main principle involved in this project is piezoelectric effect which is the conversion of mechanical force or stress into electrical energy. Mobile phones have become an integral part of our lives and are used by us to carry out various day to day activities such as banking , navigation , entertainment , booking ,education , communication etc but the mobile phones are battery constrained devices and have limited battery life and moreover making use of mobile apps and other functions leads to even higher rate of consumption of the battery. With this project now we can charge mobile phones by shouting at it or by playing music or even by making use of unwanted noises of the surroundings when the phone is discharged and we need to make an urgent call and no plug point is available nearby .

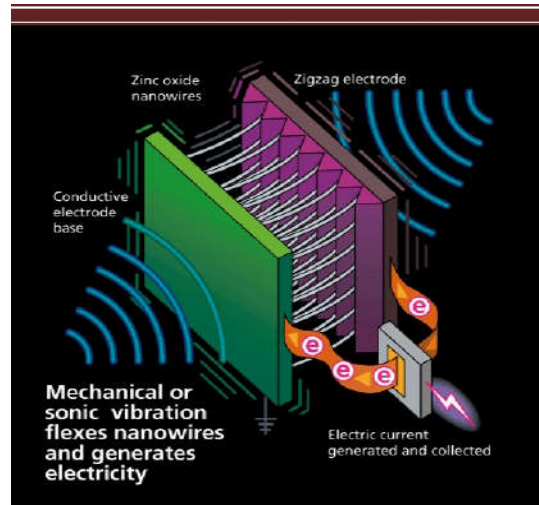
II. EXISTING SYSTEM



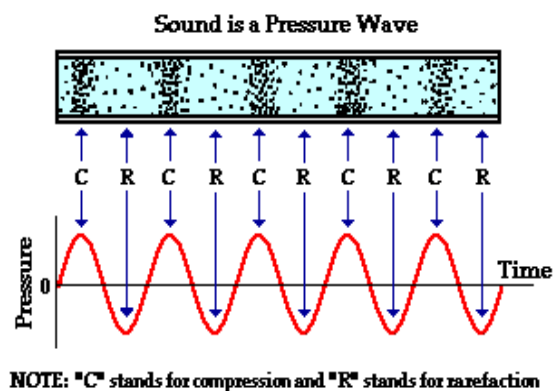
The existing system consists of a microphone to receive the sound from loud speakers and other sound sources . A **microphone** is an acoustic-to-electric transducer or sensor that converts sound into an electrical signal. Microphones are used in many applications such as telephones, hearing aids, public address systems for concert halls and public events, motion picture production, live and recorded audio engineering, two-way radios, megaphones, radio and television broadcasting, and in computers for recording voice, speech recognition, VoIP, and for non-acoustic purposes such as ultrasonic checking or knock sensors. Another approach which is used currently is to make use of piezoelectric plate or a piezoelectric sensor which is a device which uses the piezoelectric effect to measure pressure, acceleration, strain force by converting them to an electrical charge. The rise of piezoelectric technology is directly related to a set of inherent advantages. The high modulus of elasticity of many piezoelectric materials is comparable to that of many metals and goes up to 106 N/m²[citation needed] . Even though piezoelectric sensors are electromechanical systems that react to compression, the sensing elements show almost zero deflection. This is the reason why piezoelectric sensors are so rugged, have an extremely high natural frequency and an excellent linearity over a wide amplitude range. Additionally, piezoelectric technology is insensitive to electromagnetic fields and radiation, enabling measurements under harsh conditions. Some materials used (especially gallium phosphate [2] or tourmaline) have an extreme stability even at high temperature, enabling sensors to have a working range of up to 1000 °C. Tourmaline shows pyroelectricity in addition to the piezoelectric effect; this is the ability to generate an electrical signal when the temperature of the crystal changes. This effect is also common to piezo ceramic materials.

III . PROPOSED SYSTEM

The technology uses tiny strands of zinc oxide sandwiched between two electrodes. A sound absorbing pad is placed on the top of the sandwiched zinc oxide electrodes. Sound waves generated, hit the sound absorbing pad. This results in the tiny zinc oxide wires to compress and release. The compressions and rare fractions are due to the sensitivity of the ZnO. A nano generator is placed between the sandwiched zinc oxide electrodes. The compressions and rare fractions are given to the nano generator. The nanogenerator converts the given mechanical energy into electrical energy. The generated electrical energy is used to charge the battery Nano generator is a technology that converts mechanical/thermal energies produced by small-scale physical change into electricity. Nano generator has three typical approaches: piezoelectric, triboelectric, and pyroelectric nanogenerators. Both the piezoelectric and triboelectric nano generators can Convert the mechanical energy into electricity. However, the pyroelectric nano generators can be used to harvest thermal energy from a time-dependent temperature fluctuation.



Sound waves have two parts: [compression](#) and rarefaction. Compression is the part of the sound waves where the molecules of air are pushed (compressed) together. Rarefaction is the part of the waves where the molecules are far away from each other. Sound waves are a lot of compressions and rarefactions.

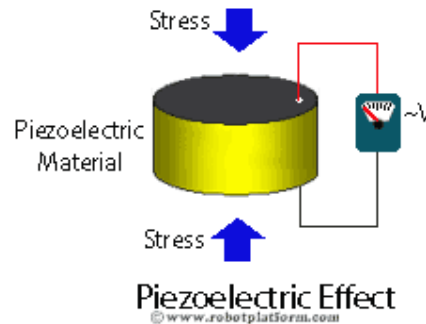


IV. OBJECTIVE

- To make use of sound energy which is a lesser used form of energy as compared to other forms such as solar energy , wind energy , thermal energy , sunlight .
- To make use of unwanted noises produced in traffic jams , airports , construction sites , industries and convert it to usable form of energy .
- To charge the mobile phone by shouting at it or by playing music .
- To be used by the user in places where no plug point is available .

V. WHAT IS PIEZOELECTRIC EFFECT?

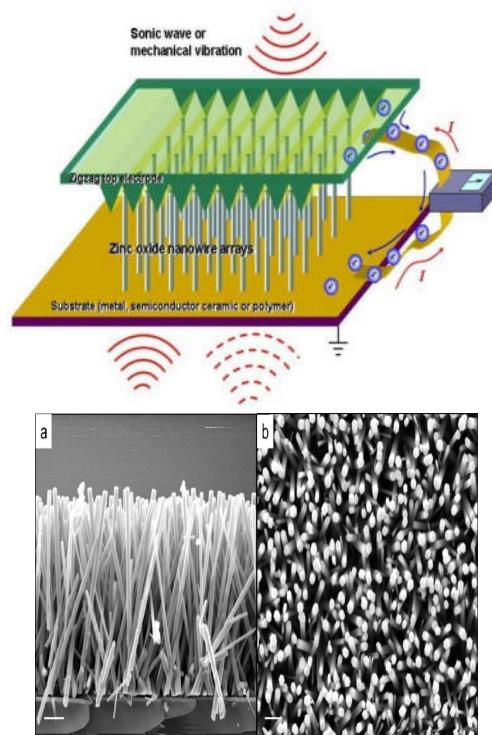
Piezoelectric Effect is the ability of certain materials to generate an electric charge in response to applied mechanical stress. One of the unique characteristics of the piezoelectric effect is that it is reversible, meaning that materials exhibiting the direct piezoelectric effect (the generation of electricity when stress is applied) also exhibit the converse piezoelectric effect (the generation of stress when an electric field is applied). When piezoelectric material is placed under mechanical stress, a shifting of the positive and negative charge centers in the material takes place, which then results in an external electrical field. When reversed, an outer electrical field either stretches or compresses the piezoelectric material.



VI. COMPONENTS USED

I. NANOGENERATOR

Nano generator is the term researchers use to describe a small electronic chip that can use mechanical movements of the body, such as a gentle finger pinch, to generate electricity. The key components inside a nano generator are nano wires or a similar structure made from a piezoelectric ceramic material. Piezoelectric materials can generate an electric current just by being bent or stressed. Hundreds of nano wires can be packed side by side in a space less than the width of a human hair. At that scale, and with the combined flexibility of the nano generator's components, even the slightest movement can generate current. It produces 4watts/m³ power per each nano wire it converts mechanical energy into electrical energy.



Each nano wire measures between 100 and 300 nanometers in diameter (the width of the wire). Each nano wire's length is about 100 microns; one micron = 100,000 nanometers. To put this in perspective, note that the length of the wire (not the width) is about the same as the width of two human hairs. An array of nano wires to the substrate and places a silicone electrode at the other end of the wires. The electrode has a zigzag pattern on its surface.

When a small physical pressure is applied to the nano generator, each nano wire flexes and generates an electrical charge. The electrode captures that charge and carries it through the rest of the nano generator circuit. The entire nano generator might have several electrodes capturing power from millions of nano wires.

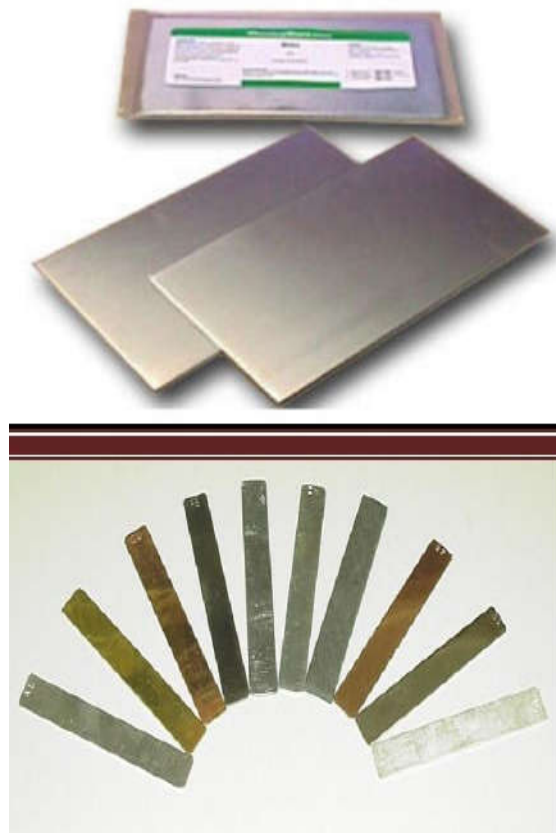
2 – SOUND ABSORBING PADS

The sound absorbing plates used in this technology are made of piezoelectric materials. These are placed on top of two sandwiched Zn electrodes.



3 – ZNO ELECTRODES

these electrodes contains nano generator between them these electrodes vibrate when sound waves hit on it compressions and rare fractions are occurred these are given to the nano generator which is placed between them.



VII . ADVANTAGES

- The mobiles can be charged not only by using our voice but also by employing background noise and music.



- Environmental noise like traffic, noise from trains, constructional noise can also be used to charge the battery.
- Music at concerts can also be used to charge the battery.
- Noise generated by walk can also be used to charge the mobile battery.
- By using industrial noise also we can charge the mobile battery.
- Noise from clubs also useful for charging purpose.
- The sound generated in the musical programs conducted in any occasions can also be useful.

VIII . DISADVANTAGES

- Lots of work is to be done in this field.
- Its efficiency is not that good so improvement is being required.
- It is bit costlier. As whole setup would be done. It could not be used in the places where decibel of sound is very low.

IX – EXPERIMENTS



EXPERIMENT 1:- DETERMINATION OF SOUND PRESSURE LEVEL

In this experiment the sound pressure level of different types of sounds found in our surroundings such as human conversation , passenger car , vacuum cleaner ,train , loud singing , buses , traffic ,noisy factory , jackhammer , construction work noises and many other sounds that are generated from different sound sources is measured by making use of HTC sound level meter SL-1350 having frequency range of 31.5 Hz to 8 KHz and the corresponding values are inserted in a table . The sound pressure level is measured in terms of decibels.

EXPERIMENT- 2 :- DETERMINATION OF VOLTAGE GENERATED AND POWER PRODUCED

In this experiment the voltage generated and the power produced by the system when it is exposed to different sounds generated from different sound sources and having different intensities and sound pressure level is found out for an increase in intensity of sound by +20dB,+10dB,+6dB,+3dB,0dB,-3dB,-6dB,-10dB,-20 dB respectively . Also the loudness gain factor is found out and sound pressure effect and sound intensity cause is also studied .

X . RESULTS

RESULT OF EXPERIMENT – 1

The table is made between the different sources of sounds and the measured sound pressure level in decibels by the sound pressure level meter for each sound generated from the given sound sources of environment .

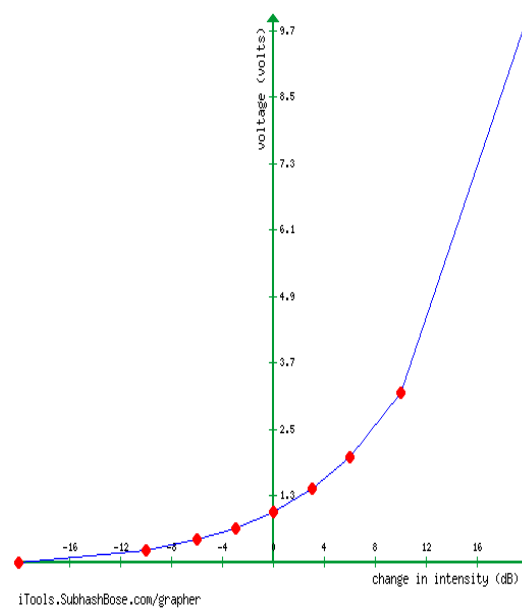
Sources of sounds	Sound pressure level in Decibels (dB)
Quietest audible sound for persons with excellent hearing under laboratory conditions ²⁾	0
Virtual silence Audiometric test room	20
Quiet whisper (1 m)	30
Quiet street Whispered speech	50
Conversation at 1 m	60
Inside a car Passenger Car 80 km/h (15 m) Vacuum cleaner (3 m) Freight Train (30 m)	70
Loud singing	75
Automobile (10 m) Pneumatic tools (15 m) Buses, diesel trucks, motorcycles (15 m) Road with busy traffic	80
	90
Food blender (1 m) Jackhammer (15 m) Bulldozer (15 m) Noisy factory Newspaper press	110
Large aircraft (150 m over head)	117
Chainsaw (1 m) Very noisy work - boilermakers workshop, etc.	

RESULT OF EXPERIMENT NO 2 :-

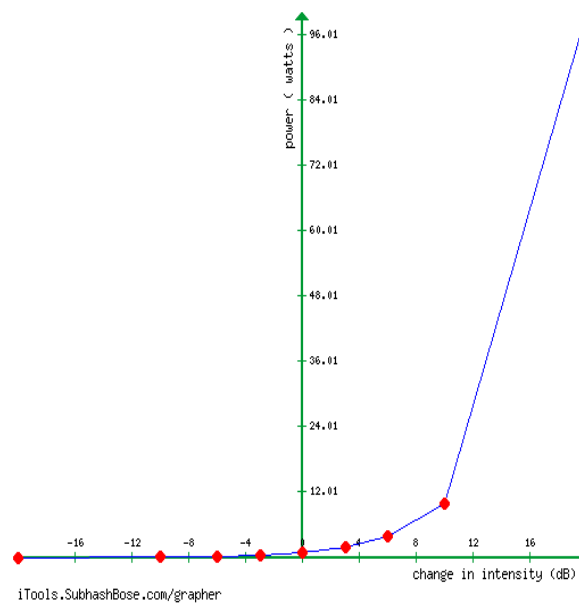
The table is made between the change in intensity (dB) , voltage generated (volts) , power produced (watts) and also loudness gain factor and corresponding graph is plotted of change in intensity vs voltage generated and change in intensity vs power produced .

Change in intensity (dB)	Loudness gain factor (L)	Voltage generated (volts)	Power produced (watts)
+20	4.000	10.000	100.000
+10	2.000	3.162	10.000
+6	1.516	2.000	4.000
+3	1.232	1.414	2.000
0	1.000	1.000	1.000
-3	0.812	0.707	0.500
-6	0.660	0.500	0.250
-10	0.500	0.316	0.100
-20	0.250	0.100	0.010

voltage vs change in intensity



power vs change in intensity



XI . APPLICATIONS

MILITARY PURPOSE:

This technology is used for “military purpose”. Generally soldiers go to different places and even some times they don’t know where they go, at that time. If they got any secret information about their rivals, it is necessary to pass the information to their superiors. Then there might be the problem of low battery. this technology is more helpful for them,

UNAVAILABILITY OF SWITCH BOARDS:

This technology is useful where there is no availability of switch boards like beach, forests. When your family is on excursion then this technology is useful.

XII. FUTURE SCOPE

If we will be able to convert sound energy to electric energy efficiently it could help us to reduce the scarcity of electrical energy globally and help in the development of mankind and reduction of CO₂ as electric energy is one of the cleanest energy. The noise pollution in the road would be able to convert into electric energy and lights the street lighting, signals and various other electrical appliances. The noise pollution in runway could be used to produce electricity. The electricity produce in nuclear power station could increase as the sound produce during nuclear fission also could be used to get more electric energy. The noise pollution in industries could be used to produce electricity and work certain low voltage machine.

XIII . CONCLUSION

We are vexed up with the normally a used lithium ion, cadmium batteries. Voice usage to charge mobile phones creates a new era with clean environment along with saving energy. As sound has enormous amount energy with it, it could be used by converting it into electric energy for various purpose. Piezo electric crystals are the crystals which converts mechanical strain to electric energy. The strain applied to piezo electric material by sound energy could be converted into electricity. In this aspect lot of research is to be done but on a positive note this could surely be done which could solve the energy problem of the entire world.

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