A REPORT ON

"FOOT STEP POWERGENERATION"

(INFORMATIVE REPORT)

2017-18

SUBMITTED BY:

STUDENTS OF FINAL YEAR ELECTRICAL

UNDER GUIDANCE OF

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Anjuman-I-Islam's

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KALSEKAR TECHNICAL CAMPUS

School of Engineering and Technology

Nev Panvel

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Submitted to:Prof. IFTEKHAR PATEL
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Dr.A.R.HONNUTAGI (DIRECTOR)

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PREFACE

We take the opportunity to present this report **"FOOT STEP POWER GENERATION"**. The objective of this report is to produce electrical energy using piezo electric sensor.

The report is supported by circuit diagrams and images to bring out the purpose and message. We have made sincere attempts and taken every care to present this report in precise and compact form, the language being as simple as possible.

The task of compl etion of the project though being difficult was made quite simple, interesting and successful due to deep involvement and complete dedication of our group members.

CERTIFICATE

Certified that the project report entitled **"FOOT STEP POWER ENERATION"** is a bonafied work done under my guidance by

FAIZAN HASHIM(14EE10)

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During the academic year **2017-18** in partial fulfillment of the requirements for the award of degree of **Bachlor of Engineering in Electrical Engineering** from **University of Mumbai**.

Date-

Examiner ________________

Prof. Iftekar Patel ________________

(Guide)

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(DIRECTOR)

ABSTRACT

In last few years low power electronic devices have been increased rapidly. The devices are used in a large number to comfort our daily lives. With the increase in energy consumption of these portable electronic devices, the concept of harvesting alternative renewable energy in human surroundings arise a new interest among us. In this project we try to develop a piezoelectric generator. That can produce energy from vibration and pressure available on some other term (like people walking). This project describes the use of piezoelectric materials in order to harvest energy from people walking vibration for generating and accumulating the energy.This concept is also applicable to some large vibration sources which can find from nature.This project also represents a footstep of piezoelectric energy harvesting model which is cost effective and easy to implement.

DECLARATION

I declare that this written submission represents my ideas in my own words and where others' ideas or words have been included, I have adequately cited and referenced the original sources. I also declare that I have adhered to all principles of academic honesty and integrity and have not misrepresented or fabricated or falsified any idea/data/fact/source in my submission. I understand that any violation of the above will be cause for disciplinary action by the Institute and can also evoke pen al action from the sources which have thus not been properly cited or from whom proper permission has not been taken when needed.

DATE……………..

PLACE…………….

(NAME OF THE STUDENTS)

FAIZAN HASHIM ………………………

SHAIKH MD MAJID ……………………....

PILANE AKSHAY ………………………

WAINGADE ANUPAM ………………………..

TABLE OF CONTENTS

LIST OF FIGURES

CHAPTER 1

INTRODUCTION

For an alternate method to generate electricity there are number of methods by which electricity can be produced, out if such methods 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 loses 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 tapped and converted in the usable form such as in electrical form. This device, if embedded in the footpath, can convert foot impact energy into electrical form. Human-powered transport has been in existence since time immemorial in the form of walking, running and swimming. However modern technology has led to machines to enhance the use of human -power in more efficient manner. In this context, pedal power is an excellent source of energy and has been in use since the nineteenth century making use of the mos t powerful muscles in the body. Ninetyfive percent of the exertion put into pedal power is converted into energy. Pedal power can be applied to a wide range of jobs and is a simple, cheap, and convenient source of energy.

However, human kinet ic energy can be useful in a number of ways but it can also be used to generate electricity based on different approaches and many organizations are already implementing human powered technologies to generate electricity to power small electronic appliance s. Energy is the ability to do work. While enery surrounds us in all aspects of life,the ability to harness it and use it for constructive ends as economically as possible is the challange before mankind. Alternative energy refers to energy sources,which a re not based on the burning of fossil fuels or the splitting of atoms. The renewed interested in this field of study comes from the undesirable ffect of pollution (as witnessed today) both from burning fossil fuel and from nuclear waste byproducts.Fortunately there are many means of harnessing energy, which less damaging impact on our invironment in India.The alternatives are solar, wind power generation, geothermal tides,hydroelectric.In addition to these we have developed a new methodol ogy of generation power using human energy and the name of this alternative is foot step power generation.

MODEL OF FOOTSTEP ENERGY GENERATION

Fig. 1.1: Storing Device for Foot Step Electric Energy

The working of the Foot Stop Electric Converter (FSEC) i s demonstrated in photographs in The right side photograph shows the foot touching the top plate without applying weight. The left side Photograph shows the foot when full weight of the body is transferred to the top plate. A 6 W, 12V bulb connected to the output of the alternator glows, to indicate the electric output when foot load is applied. The unit is designed to generate full power pulse when actuated by a person weighing nearly 60 kg. An experimental plot of voltage vs. time was generated, by using an oscilloscope. Using voltage data and the load (a resistor), a typical plot of power vs. time was generated. The power generated by the foot step generator can be stored in an energy storing device. The output o f the generator was fed to a 12 lead acid b attery, through an ac-dc converter bridge. Initially, the battery was completely discharged. Then, the FSEC was operated by applying foot load and energy was stored in the battery. A 100 W, 230V bulb was connected to the battery through an inverter. The arrangement is shown in Fig. 4. The duration of ligh ting, the bulb for number of footsteps and corresponding energy stored, are given in Table 1.

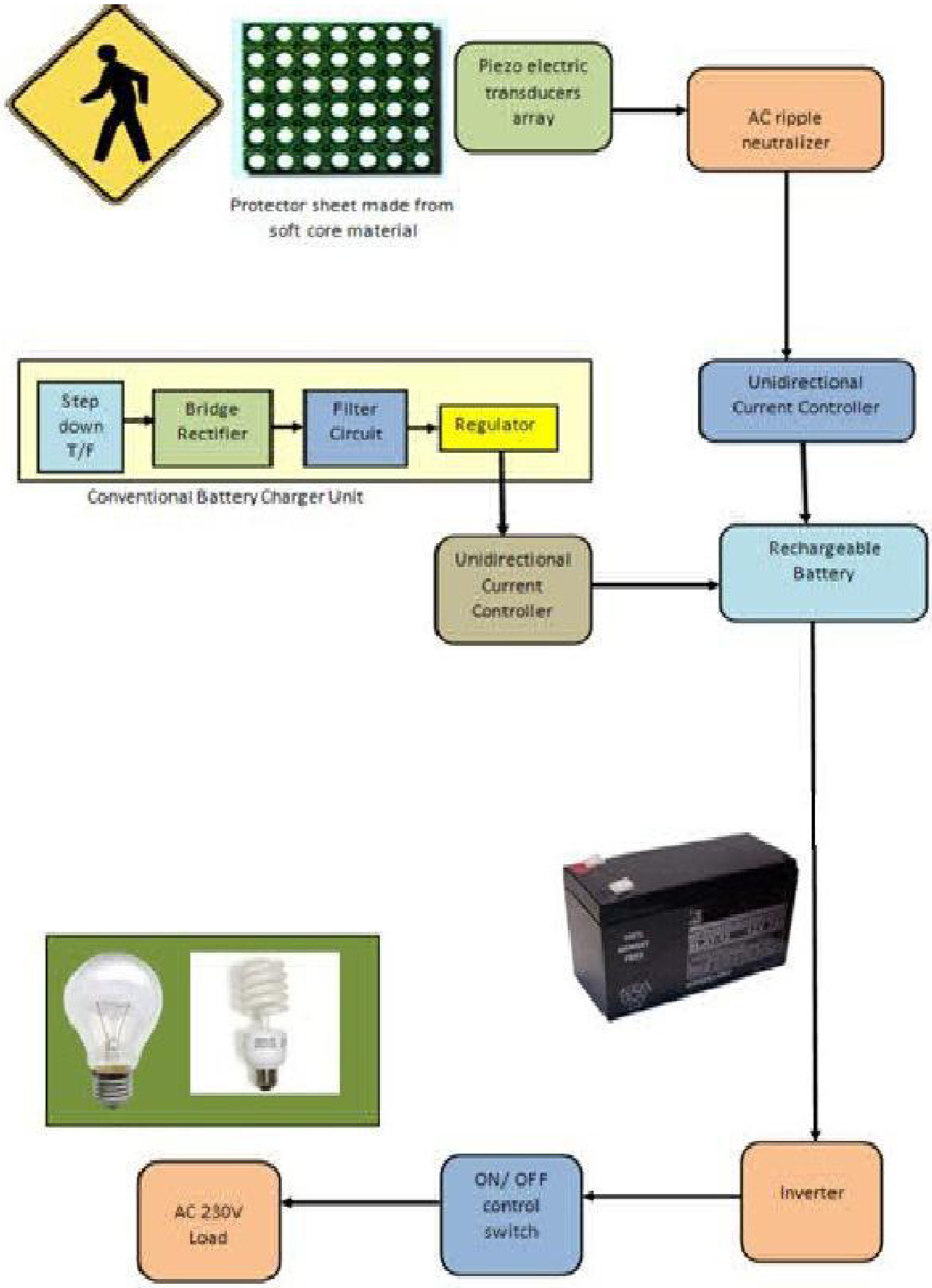


Figure 1.2: Foot Step Power Generation System For Rural Energy Application To Run Ac And Dc Loads

The basic working principle of our project is based on the piezoelectric sensor . To implement this we adjust the wooden plates above and below the sensors and moveable springs. Non-conventional energy using foot step is converting mechanical energy into the electric al energy. Foot step board it consist of a 16 piezo electric sensors which are connected in parallel. When the pressure is applied on the sensors, the sensors will convert mechanical energy into electrical energy. This electrical energy will be storing in the 12v rechargeable battery connected to inverter. We are using conventional battery charging unit also for giving supply to the circuitry. This inverter is used to convert the 12 Volt D.C to the 230 Volt A.C. This 230 Volt A.C voltage is used to activate the loads. By using this AC voltage we can operate AC loads.

ENERGY STORING TABLE

The power generated by the foot step generator can be stored in an energy storing device. The output of the generator was fed to a 12 V lead acid battery, through an ac-dc converter bridge. Initially, the battery was completely discharged. Then, the FSEC was operated by applying foot load and energy was stored in the battery. A 100 W, 230V bulb was connected to the battery through an inverter. The arrangement is shown in Fig . 4. The duration of lighting, the bulb for number of footsteps and corresponding energy stored, are given in Table 1.

No. of foot steps	Duration of lighting a 100 watt 230 Volt bulb (s)	Total energy (J)	Energy /step (J)
250	6	600	2.4
500	12	1200	2.4
750	18	1800	2.4
1000	25	2500	2.5

Table 1: Energy storing table

The piezoelectric material converts the pressure applied to it into electrical energy. The source of pre ssure can be either from the weight of the moving vehicles or from the weight of the people walking over it. The output of the piezoelectric material is not a steady one. So a bridge circuit is used to convert this variable voltage into a linear one. Again an AC ripple filter is used to filter out any further fluctuations in the output. The output dc voltage is then stored in a rechargeable battery. As the power output from a single piezo -film was extremely low, combination of few Piezo films was investigat ed. Two possible connections were tested - parallel and series connections. The parallel connection did not show significant increase in the voltage output. With series connection, additional piezofilm results in increased of voltage output but not in line ar proportion. So here a combination of both parallel and series connection is employed for producing 40V voltage output with high current density. From battery provisions are provided to connect dc load. An inverter is connected to battery to provide provision to connect AC load. The voltage produced across the tile can be seen in a LCD.

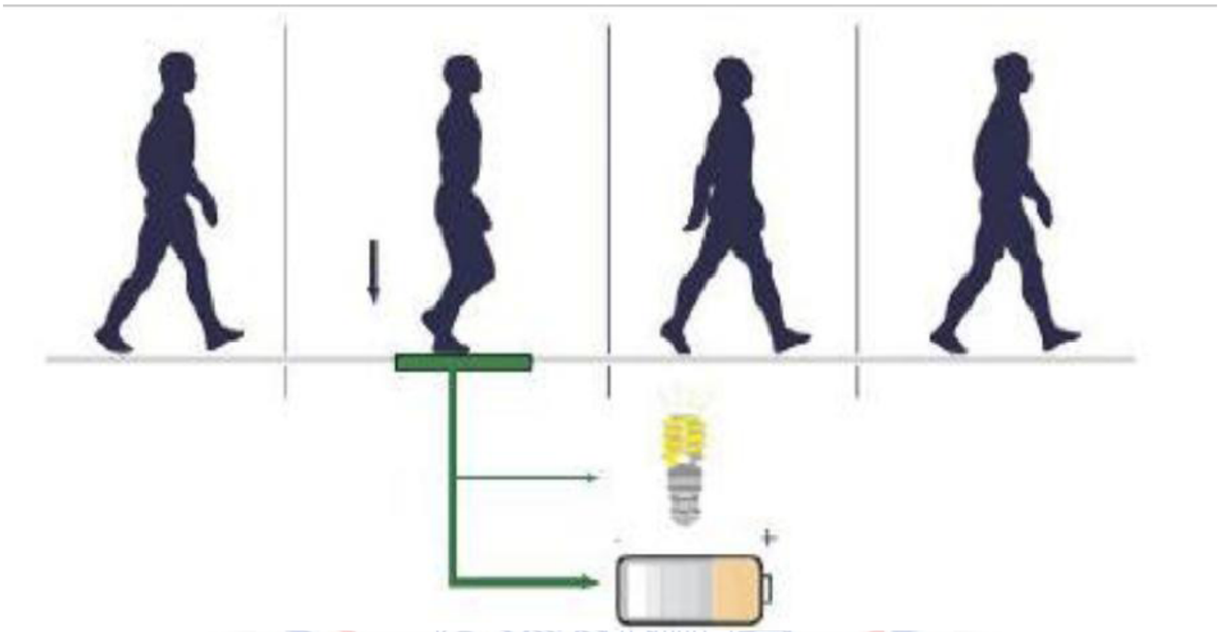


Fig-1.3: Schematic representation of the working model

CHAPTER 2

NEED OF THAT SYSTEM

Proposal for the utilization of waste energy of foot power with human locomotion is very much relevant and important for highly populated countries like India and China where the roads, railway stations, bus stands, temples, etc. are all over crowded and millions of people move around the clock. This whole human/ bioenergy b eing wasted if can be made possible for utilization it will be great invention and crowd energy farms will be very useful energy sources in crowded countries. Walking across a "Crowd Farm," floor, then ,will be a fun for idle people who can improve their h ealth by exercising in such farms with earning. The electrical energy generated at such farms will be useful for near by applications The utilization of waste energy of foot power with human motion is very important for highly populated countries. India and China where the roads, railway stations, temples, etc. are all over crowded and millions of people move around the clock.

MAXIMUM THEORETICAL VOLTAGE GENERATED

When a force is applied on piezo material, a charge is generated across it. Thus, it can be as sumed to be an ideal capacitor. Thus, all equations governing capacitors can be applied to it. In this project, on one tile, we connect 3 piezo in series.10 such series connections are connected in parallel. Thus when 3 piezoelectric discs are connected in series, its equivalent capacitance becomes:

$$\frac{1}{Ceq} = \frac{1}{C1} + \frac{1}{C2} + \frac{1}{C3}$$

We know, $Q = C * V$

So, $C = \frac{Q}{V}$

Hence, $\frac{Veq}{Q} = \frac{V1}{Q} + \frac{V2}{Q} + \frac{V3}{Q}$

Thus, $Veq = V1 + V2 + V3$

Hence, the net voltage generated in series connection is the sum of individual voltages generated across each piezoelectric disc. Output voltage from 1 piezo disc is 13V.

Thus, $V_{eq}=V1+V2+V3$

$= 13+13+13$

$=39V$

Thus the maximum voltage that can be generated across the piezo tile is around 39V.

ANALYSIS DONE ON THE PIEZO TILE

People whose weight varied from 40kg to 75 kg were made to walk on the piezo tile to test the voltage generating capacity of the Piezo tile. The relation between the weight of the person and power generated is plotted in figure 8. From the graph it can be seen that, maximum voltage is generated when maximum weight/force is applied. Thus, maximum voltage of 40V is generated across the tile when a weightof 75 K g is applied on the tile. Fig 8: Weight V/s power graph of piezo tile

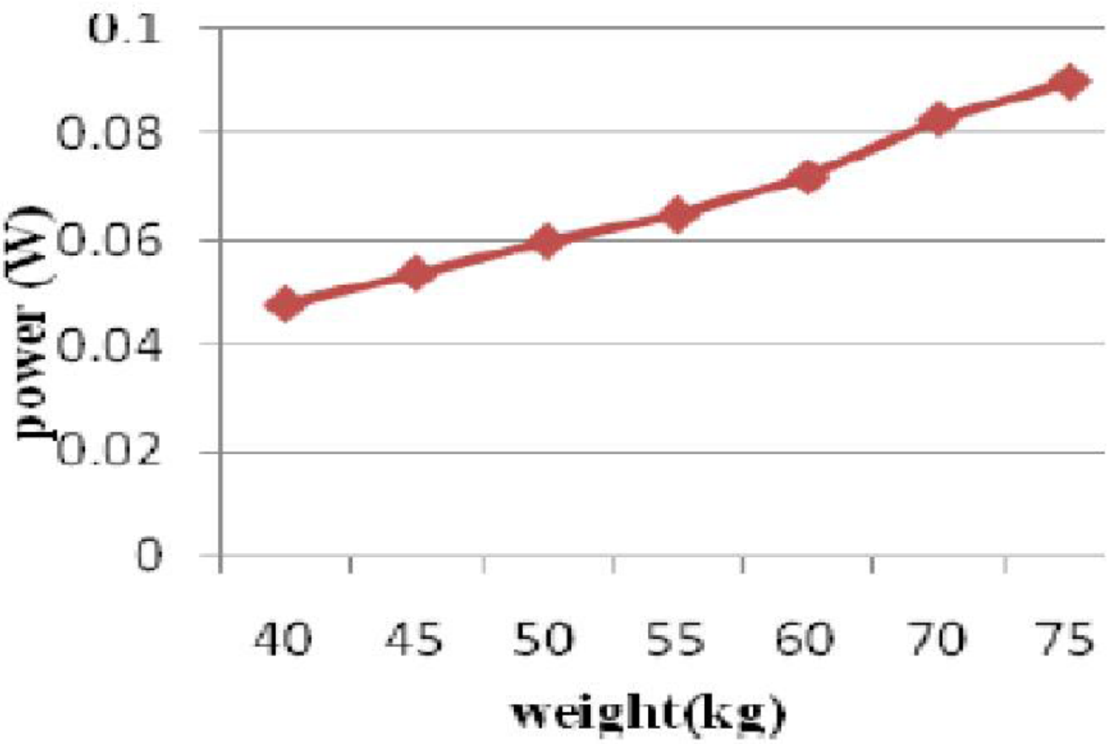


Fig 2.1: Weight V/s power graph of piezo tile

INITIATIVE

Working on the idea to harness human locomotion power, MIT (USA) architecture students James Graham and Thaddeus Jusczyk recent ly unveiled what they're calling the "Crowd Farm," a setup that would derive energy from pounding feet in crowded places. This technology is a proposal to harness human power as a source of sustainable energy. Population of India and mobility of its masses will turn into boon in generating electricity from its (population's) footsteps.

Human locomotion in over crowded subway stations, railway stations, bus stands, airports, temples or rock concerts thus can be converted to electrical energy with the use of this promising technology. The technology would turn the mechanical energy of people walking or jumping into a source of electricity. The students' test case, displayed at the Venice Biennale and in a train station in Torino, Italy, was a prototype stool that exploits the passive act of sitting to generate power. The weight of the body on the seat causes a flywheel to spin, which powers a dynamo that, in turn, lights four LEDs. In each case, there would be a sub -flooring system consisting of independent blocks. When people walk across this surface, the forces they impart will cause the blocks to slip slightly, and a dynamo would convert the energy in those movements into electric current. Students say that moving from this Proof-of-concept device to a large-scale Crowd Farm would be expensive, but it certainly sounds a great option.

SENSOR

A sensor is a device that measures a physical quantity and converts it into a signal which can be read by an observer or by an instrument. For example, mercury converts th e measured temperature into expansion and contraction of a liquid which can be read on a calibrated glass tube. At thermocouple converts temperature to an output voltage which can be read by a voltmeter. For accuracy, most sensors are calibrated against kn own standards. Piezoelectric Sensor A piezoelectric sensor is a device that uses the piezoelectric effect to measure pressure, acceleration, strain or force by converting them to an electrical signal. Piezoelectric sensors have proven to be versatile tools for the measurement of various processes. They are used for quality assurance, process control and for research and development in many different industries it was only in the 1950s that the piezoelectric effect started to be used for industrial sensing a pplications. Since then, this measuring principle has been increasingly used and can be regarded as amature technology with an outstanding inherent reliability. It has been successfully used in various applications, such as in medical, aerospace, nuclear instrumentation, and as a pressure sensor in the touch pads of mobile phones. In the automotive industry, piezoelectric elements are used to monitor combustion when developing internal combustion engines. The sensors are either directly mounted into additional holes into the cylinder head or the spark/glow plug is equipped with a built in miniature piezoelectric sensor.

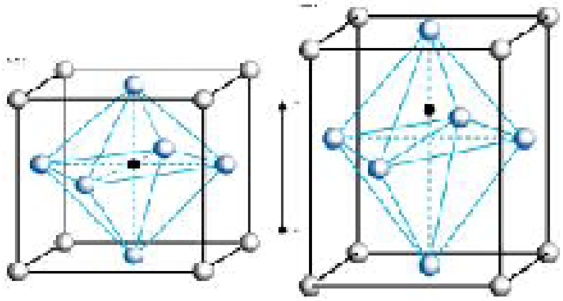
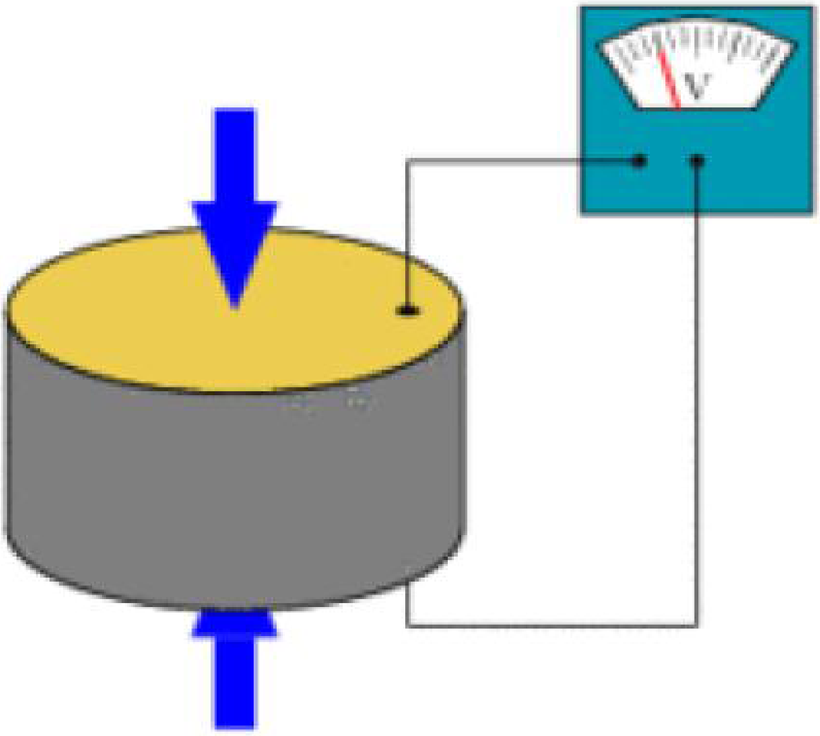


Fig-2.2:Piezoelectric Sensor

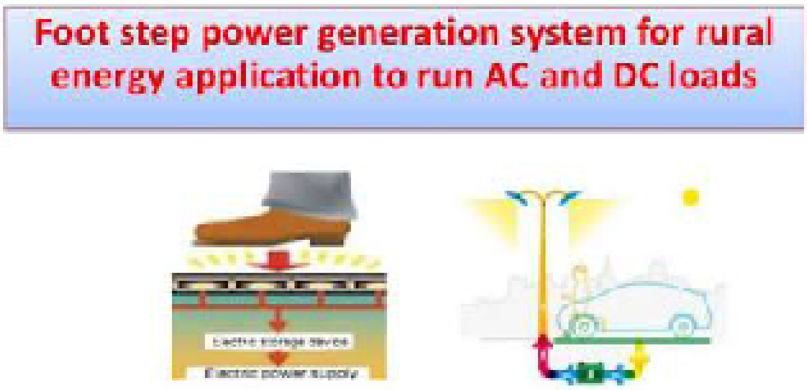
The rise of piezoelectric technology is directly related to a set of inherent advantages. The high modulus of elasticity of many piezoelectric materials is comparable to that of many metals and goes up to 10e6 N/m²[Even though piezoelectric sensors are electromechanical systems that react to compression, 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, en abling measurements under harsh conditions. Some materials used (especially gallium phosphate or tourmaline) have an extreme stability even at high temperature, enabling sensors to have a working range of up to 1000°C. Tourmaline shows piezoelectricity 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 piezoceramic materials. One disadvantage of piezoelectric sensors is that they cannot be u sed for truly static measurements. A static force will result in a fixed amount of charges on the piezoelectric material. While working with conventional readout electronics, imperfect insulating materials, and reduction in internal sensor resistance will result in a constant loss of electrons, and yield a decreasing signal.



Elevated temperatures cause an additional drop in internal resistance and sensitivity. The main effect on the piezoelectric effect is that with increasing pressure loads and temperat ure, the sensitivity is reduced due to twin -formation.

While quartz sensors need to be cooled during measurements at temperatures above 300°C, special types of crystals like GaPO4 gallium phosphate do not show any twin formation up to the melting point of the material. Whenever force is applied on piezo electric catalyst that force is converted in to electrical energy. It can be used to drive DC loads. And that minute voltage which is stored in the lead acid battery. The battery is connected to the inverter . This inverter is used to convert 12V dc to 230V ac. This 230V ac voltage is used to activate the loads.We are using conventional battery charging unit also for giving supply to the circuitry.

Designing Figure



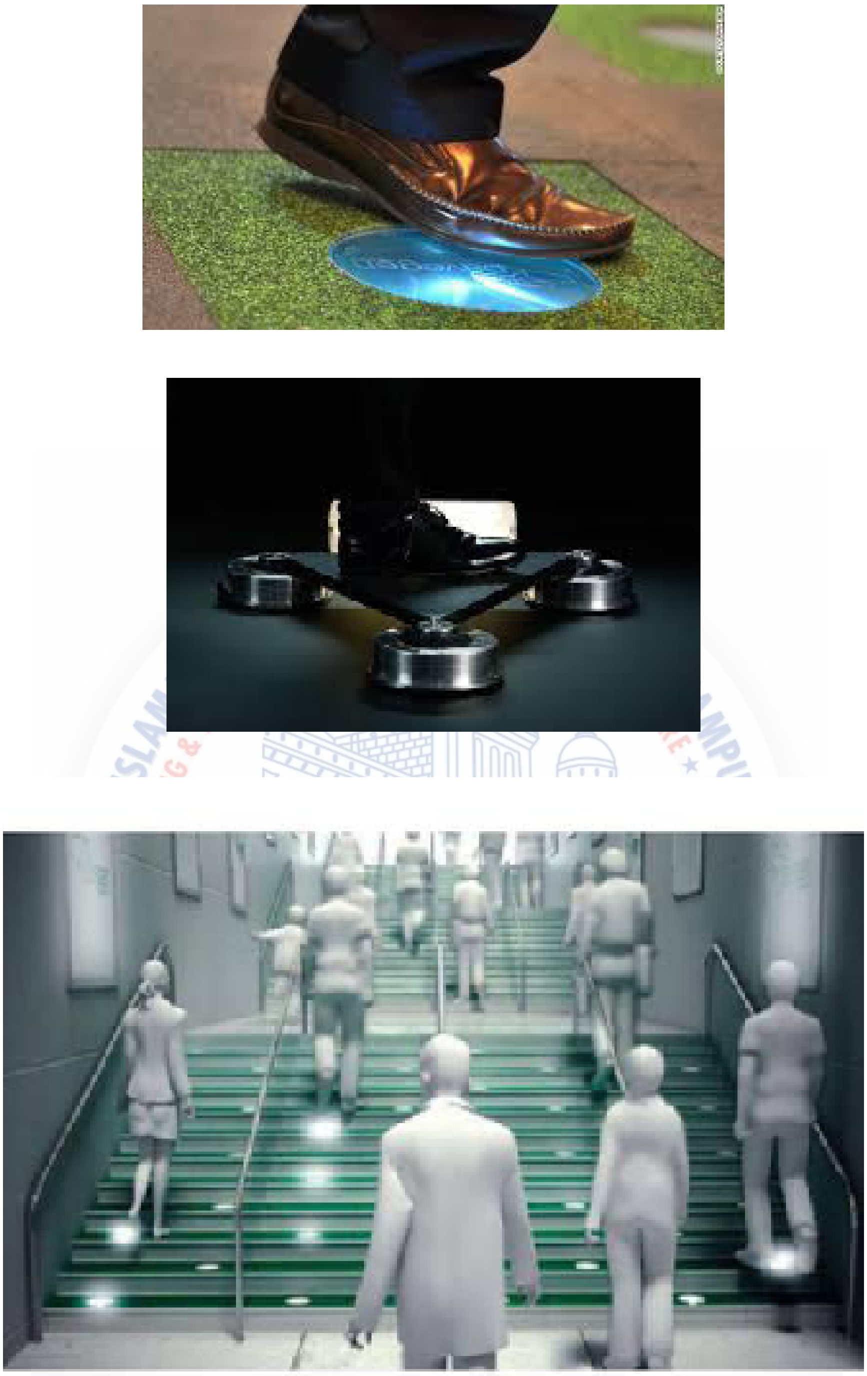


Fig 2.3:designing of piezoelectric system

CHAPTER 3

BATTERY

Categories and types of batteries

Batteries are classified into two broad categories , eacht ype with advantages and disadvantages. Primary batteries irreversibly (within limits of practicality) transform chemical energy to electrical energy. When the initial supply of reactants is exhausted, energy can not be readily restored to the battery by electrical means.Secondary batteries can be recharged; that is, they can have their chemical reactions reversed by supplying electrical energy to the cell, restoring their original composition.Historically, some types of primary batteries used, for example, for telegraph circuits, were restored to operation by replacing the components of the battery consumed by the ch emical reaction. Secondary batteries are not indefinitely rechargeable due to dissipation of the active materials, loss of electrolyte and internal corrosion.

Figure 3.1:Different Types Of Batteries

PRIMARY BATTERIES

Primary batteries can produce current immediately on assembly. Disposable batteries are intended to be used once and discarded. These are most commonly used in portable devices that have low current drain, are only used intermittently, or are used well away from an alternative power so urce, such as in alarm and communication circuits where other electric power is only intermittently available. Disposable primary cells cannot be reliably recharged, since the chemical reactions are not easily reversible and active materials may not return to their original forms. Battery manufacturers recommend against attempting to recharge primary cells. Common types of disposable batteries include zinc -carbon batteries and alkaline batteries.Generally, these have higher energy densities than rechargeable batteries, but disposable batteries do not fare well under high -drain applications with loads under 75 ohms (75 Ù).

SECONDARY BATTERIES

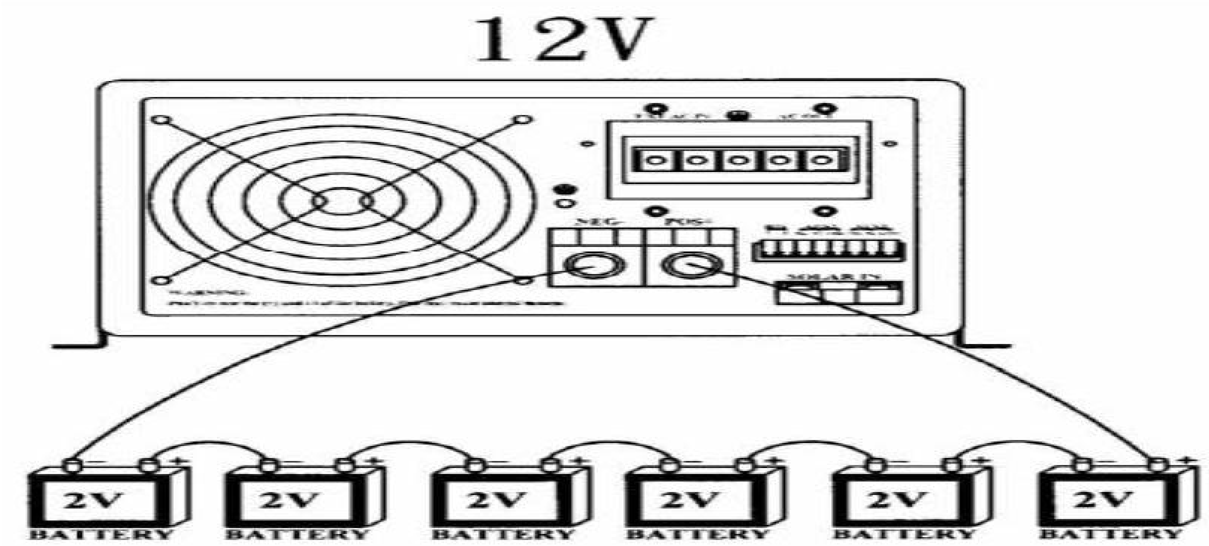
Secondary batteries must be charged before use; they are usually assembled with active materials in the di scharged state. Rechargeable batteries or secondary cells can be recharged by applying electrical current, which reverses the chemical reactions that occur during its use. Devices to supply the appropriate current are called chargers or rechargers.The oldest form of rechargeable battery is the lead -acid battery. This battery is notable in that it contains a liquid in an unsealed container, requiring that the battery be kept upright and the area be well ventilated to ensure safe dispersal of the hydrogen gas produced by these batteries during over charging.The lead -acid battery is also veryh eavy for the amount of electrical energy it can supply. Despite this, its low manufacturing cost and its high surge current levels make its use common where a large capac ity (over approximately 10Ah) is required or where the weight and ease of handling are not concerns. A common form of the lead -acid battery is the modern car battery, which can generally deliver a peak current of 450 amperes. An improved type of liquid electrolyte battery is the sealed valve regulated lead acid (VRLA) battery, popular in the automotive industry as a replacement for the lead -acid wet cell. The VRLA battery uses an immobilized sulfuric acid electrolyte, reducing the chance of leakage and exte nding shelf life. VRLA batteries have the electrolyte immobilized, usually by one of two means. Gel batteries (or "gel cell") contain a semi-solid electrolyte to prevent spillage. Absorbed GlassMat (AGM) batteries absorb the electrolyte in special fiber gla ss matting. Other portable rechargeable batteries include several "dry cell" types, which are sealed units and are therefore useful in appliances such as mobile phones and laptop computers. Cells of this type (in order of increasing power density and cost) include nickel-cadmium (NiCd), nickel-zinc (NiZn), nickel metal hydride (NiMH) and lithium -ion (Li-ion) cells. By far, Li-ion has thehighest share of the dry cell rechargeable market. Meanwhile, NiMH has replaced NiCd in most applications due to its highe r capacity, but NiCd remains in use in power tools, two-way radios, and medical equipment. NiZn is a new technology that is not yet well esta-blishhed commercially. Recent developments include batteries with embedded functionali-ty such as USBCELL, with a built-in charger and USB connector within the AA format, enabling the battery to becharged by plugging into a USB port without a charger, and low self -discharge (LSD) mix chemistries such as Hybrio, ReCyko, and Eneloop,where cells are recharged prior to sh ipping. Battery (electricity), an array of electrochemical cells for electricity storage, either individually linked or individually linked and housed in a single unit. An electrical battery is a combination of one or more electrochemical cells, used to co nvert stored chemical energy into electrical energy. Batteries may be used once and discarded, or recharged for years as in standby power applications. Miniature cells are used to power devices such as hearing aids and wristwatches; larger batteries provid e standby power for telephone exchanges or computer data centers.

Lead-acid batteries are the most common in PV systems because their initial cost is lower and because they are readily available nearly everywhere in the world. There are many different sizes and designs of lead -acid batteries, but the most important designation is that they are deep cycle batteries. Lead -acid batteries are available in both wet-cell (requires maintenance) and sealed no -maintenance versions. Lead acid batteries are reliab le and cost effective with an exceptionally long life. The Lead acid batteries have high reliability because of their ability to withstand overcharge, over discharge vibration and shock. The use of special sealing techniques ensures that our batteries are leak proof and non-spoilable. The batteries have exceptional charge acceptance, large electrolyte volume and low self- ischarge, Which make them ideal as zero - maintenance batteries lead acid batteries Are manufactured/ tested using CAD (Computer Aided Des ign). These batteries are used in Inverter & UPS Systems and have the proven ability to perform under extreme conditions. The batteries have electrolyte volume, use PE Separators and are sealed in sturdy containers, which give them excellent protection against leakage and corrosion.

BATTERY CONNECTIONS

Lead-acid batteries are normally available in blocks of 2V, 6V or 12V. In most cases, to generate the necessary operating voltage and the capacity of the batteries for the Solar Inverter, many batteries have to be connected together in parallel and/or in series. Following three examples are shown:

SERIES CONNECTION



PARALLEL CONNECTION

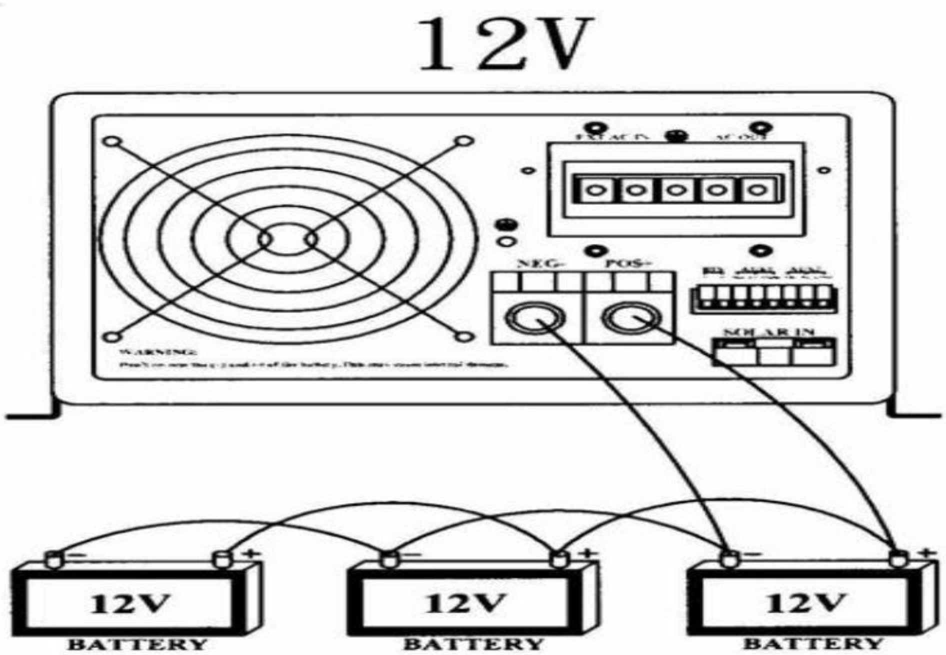


Fig 3.2: Battery connections

BATTERY LIFETIME

Even if never taken out of the original package, disposable (or "primary") batteries can lose 8 to 20 percent of their original charge every year at a temperature of about 20°–30°C. This is known as the "self discharge" rate and is due to oncurrent- producing "side" chemical reactions, which occur within the cell even if no load is applied to it. The rate of the side reactions is reduced if the batteries are stored at low temperature, although some batteries can be damaged by freezing.High or low temperatures may reduce battery performance. This will affect the initial voltage of the battery. For an AA alkaline battery this initial voltage is approximately normally distributed around 1.6 volts. Discharging performance of all batteries drops at low temperature.

CHAPTER 4

RECTIFIER

The output from the transformer is fed to the rectifier. It converts A.C. into pulsating D.C. The rectifier may be a half wave or a full wave rectifier. In this project, a bridge rectifier is used because of its merits like good stability and full wave rectification. The Bridge rectifier is a c ircuit, which converts an ac voltage to dc voltage using both half cycles of the input ac voltage. The Bridge rectifier circuit is shown in the figure. The circuit has four diodes connected to form a bridge. The ac input voltage is applied to the diagonall y opposite ends of the bridge. The load resistance is connected between the other two ends of the bridge.

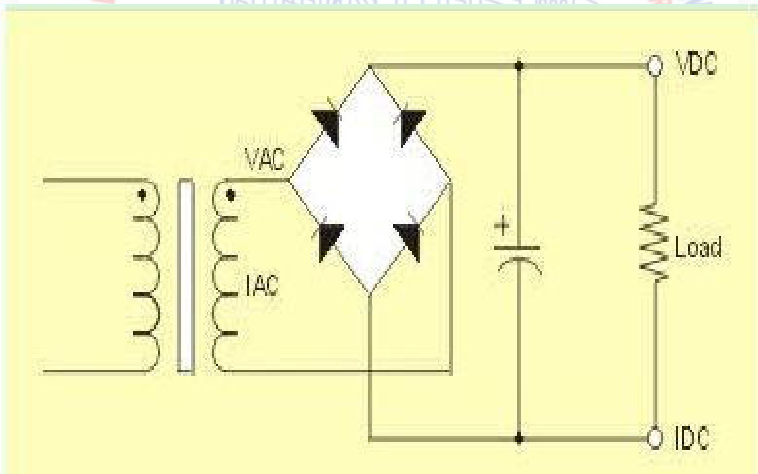


Figure 4.1:Rectifier Circuit

For the positive half cycle of the input ac voltage, diodes D1 and D3 conduct, whereas diodes D2 and D4 remain in the OFF state. The conducting diodes will be in series with the load resistance RL and hence the load current flows through RL. For the negative half cycle of the input ac voltage, diodes D2 and D4 conduct whereas, D1 and D3 remain OFF. The conducting diodes D2 and D4 will be in series with the load resistance RL and hence the current flows through RL in the same direction as in the previous half cycle. Thus a bi -directional wave is onverted into a unidirectional wave.

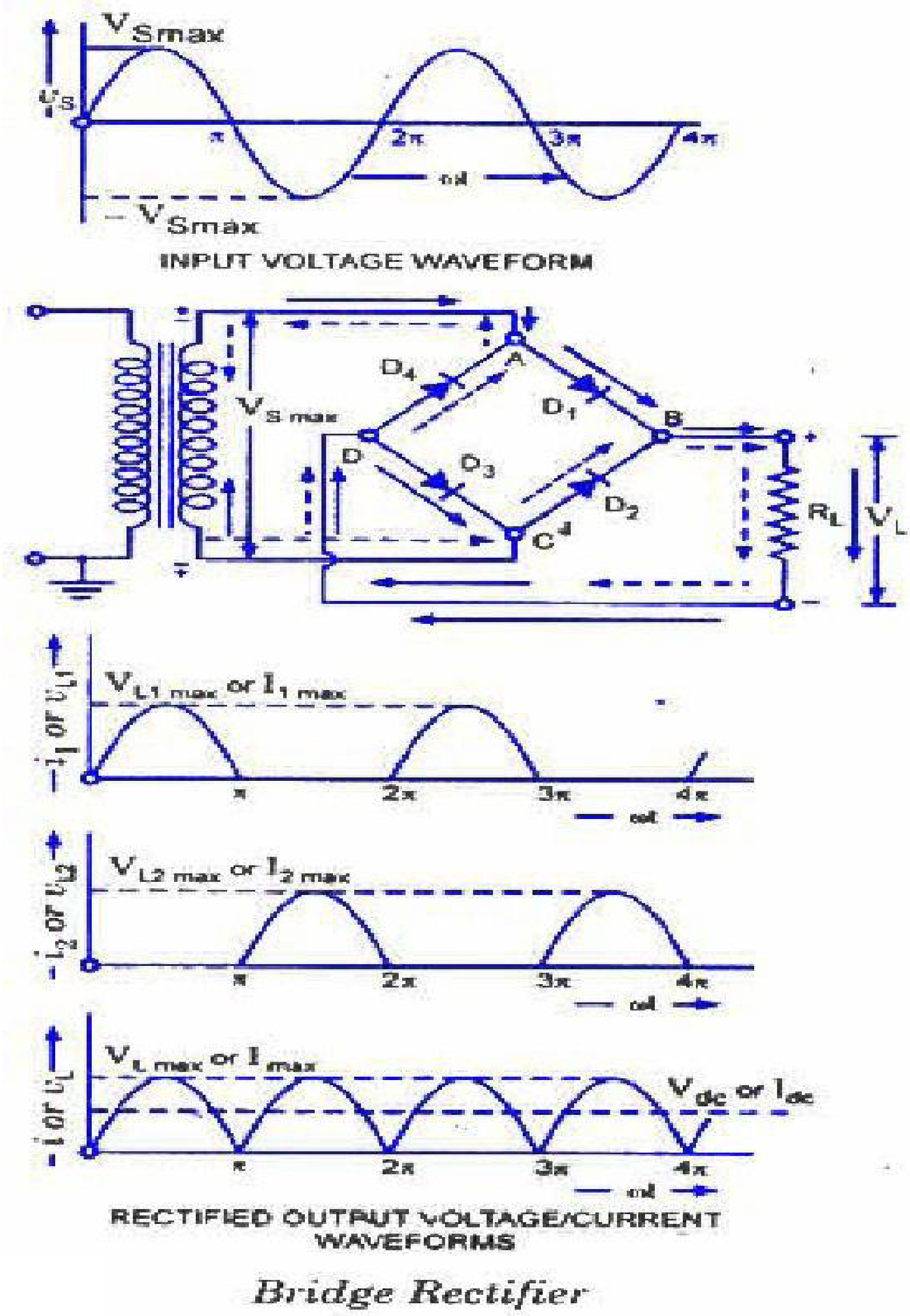


Fig 4.2:Bridge rectifier

FILTER

Capacitive filter is used in this project. It removes the ripples from the output of rectifier and smoothens the D.C.Output received from this filter is constant until the mains voltage and load is maintained constant. However, if either of the two is varied, D. C. voltage received at this point changes. Therefore a regulator is applied at the output stage.

VOLTAGE REGULATOR:

As the name itself implies, it regulates the input applied to it. A voltage regulator is an electrical regulator designed to automatically maintain a constant voltage level. In this project, power supply of 5V and 12V are required. In order to obtain these voltage levels, 7805 and 7812 voltage regulators are to be used. The first number 78 represents positive supply and the numbers 05, 12 rep resent the required output voltage levels. These regulators can provide local on -card regulation, eliminating the distribution problems associated with single point regulation. Each type employs internal current limiting, thermal shut -down and safe area protection, making it essentially indestructible.

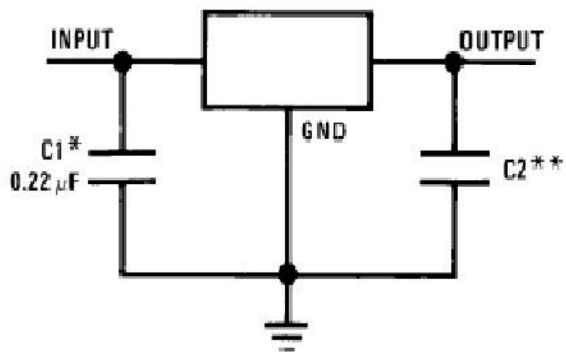


Figure 4.3:Voltage Regulator Circuit

UNIDIRECTIONAL CURRENT CONTROLLER.

As name indicates this circuit allows only one direction current flowing. There are following some devices allow on unidirectional current.

1) Diode

2) Thyristors

In this project we are going to use diode as Unidirectional Current control device. As we are already familiar with the most common function of a diode is to allow an electric current to pass in one direction (called the dio de's forward direction).While blocking current in the opposite direction (the reverse direction). Thus, the diode can be thought of as an electronic version of a check valve. The diode used in this project is D=1N4007.

CHAPTER 5

INVERTER

An inverter is an electrical device that converts direct current (DC) to alternating current (AC); the converted AC can be at any required voltage and frequency with the use of appropriate transformers, switching, and control circuits. Solid-state inverters h ave no moving parts and are used in a wide range of applications, from mall switching power supplies in computers, to large electric utility high-voltage direct current applications that transport bulk power. Inverters are commonly used to supply AC power from DC sources such as solar panels or batteries. There are two main types of inverter. The output of a modified sine wave inverter is similar to a square wave output except that the output goes to zero volts for a time before switching positive or negat ive. It is simple and low cost and is compatible with most electronic devices, except for sensitive or specialized equipment, for example certain laser printers. A pure sine wave inverter produces a nearly perfect sine wave output (<3% total harmonic disto rtion) that is essentially the same as utility -supplied grid power. Thus it is compatible with all AC electronic devices. This is the type used in gridtie inverters. Its design is more complex, and costs 5 or 10 times more per unit power. The electrical in verter is a high-power electronic oscillator. It is so named because early mechanical AC to DC converters was made to work in reverse, and thus were "inverted", to convert DC to AC. The inverter performs the opposite function of a rectifier.

BULB

Figure 5.1: 220 v Ac Blub

A bulb is a short stem with fleshy leaves or leaf bases. The leaves often function as food storage organs during dormancy. A bulb's leaf bases generally do not support leaves, but contain food reserves to enable the plant to surv ive adverse conditions. The leaf bases may resemble scales, or they may overlap and surround the center of the bulb as with the onion. A modified stem forms the base of the bulb, and plant growth occurs from this basal plate. Roots emerge from the underside of the base, and new stems and leaves from the upper side. Other types of storage organs (such ascorms,rhizomes, and tubers) are sometimes erroneously referred to as bulbs. The correct term for plants that form underground storage organs, including bulbs as well as tuber sandcorms, is geophytes. Some epiphytic orchids (family Orchidaceous) form above -ground storage organs called pseudo bulbs that super ficially resemble bulbs.

ADVANTAGE

Power generation is simply walking on step.

No need fuel input.

This is a Non-conventional system.

No moving parts - long service life.

Self-generating - no external power required.

Compact yet highly sensitive

Reliable, Economical, Eco-Friendly.

Less consumption of Non- renewable energies.

Power also generated by running or exercising on the step.

Battery is used to store the generated power

Extremely wide dynamic range, almost free of noise

DISADVANTAGE

Only applicable for the particular place.

Initial cost of this arrangement is high.

Output affected by temperature variation.

Initial cost of this arrangement is high.

Care should be taken for batteries

APPLICATION

Foot step generated power can be used for agricultural, home applications, street-lighting.

Foot step power generation can be used in emergency power failure situations.

Metros, Rural Applications etc.

It can be used as a source for both A.C and D.C applications

It is also used in universities .

It can use in emergency power failure situations like hospitals.

CHAPTER 6

CONCLUSION

1. The project "POWER GENERATION USING FOOT STEP" is successfully tested and implemented which is the best economical, affordable energy solution to common people. 2. This can be used for many applications in rural areas where power availability is less or totall y absence As India is a developing country where energy management is a bi g challenge for huge population . Comparison between various piezo electric material shows that PZT is superior in characteristics. Also, by comparison it was found that series - parallel combination connection is more suitable. The weight applied on the tile and corresponding voltage generated is studied and they are found to have linear relation. It is especially suited for implementation in crowded areas. This can be used in street l ighting without use of long power lines. It can also be used as charging ports, lighting of pavement side buildings. As a fact only 11% of renewable energy contributes to our primary energy. If this project is deployed then not only we can overcome the ene rgy crises problem but this also contributes to create a healthy global environmental change.

Smart system.

Produce 2000 watts of electricity.

Durable.

Have a life of approx. 5 years.

CHAPTER 7

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