ISSN: 0976-2876 (Print)
ISSN: 2250-0138 (Online)

NON-CONVENTIONAL ENERGY USING FOOT STEP BY CONVERTING MECHANICAL ENERGY INTO THE ELECTRICAL ENERGY

SHRINATH BHOSLE[1]

Assistant Professor, Department of Mechanical Engineering, BKIT Bhalki, Karnataka, India

ABSTRACT

Man has needed and used energy at an increasing rate for his sustenance and wellbeing ever since he came on the earth a few million years ago. Due to this a lot of energy resources have been exhausted and wasted. 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/ bio-energy being 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

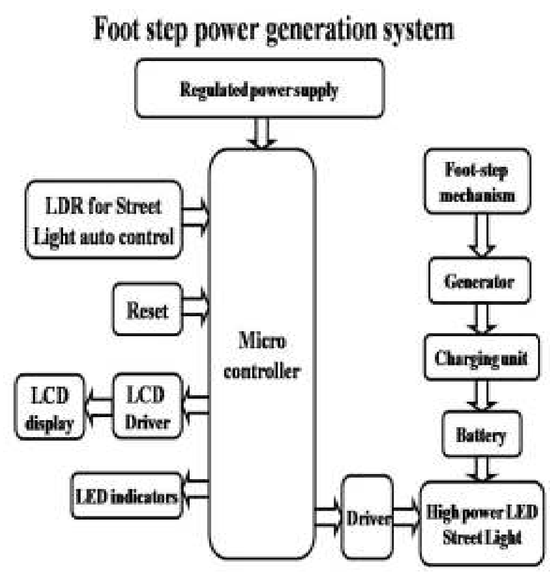
In this project we are generating electrical power as non-conventional method by simply walking or running on the foot step. Non-conventional energy system is very essential at this time to our nation. Non-conventional energy using foot step is converting mechanical energy into the electrical energy. This project uses piezoelectric sensor.

KEYWORDS: Piezo electric sensor, A.C ripples neutralizer, Unidirectional current controller and 12V, 1.3Amp lead acid dc rechargeable battery, etc

Man has needed and used energy at an increasing rate for his sustenance and wellbeing ever since he came on the earth a few million years ago. Primitive man required energy primarily in the form of food. He derived this by eating plants or animals, which he hunted. Subsequently he discovered fire and his energy needs increased as he started to make use of wood and other bio mass to supply the energy needs for cooking as well as for keeping himself warm.

With the passage of time, man started to cultivate land for agriculture. He added a new dimension to the use of energy by domesticating and training animals to work for him. With further demand for energy, man began to use the wind for sailing ships and for driving windmills, and the force of falling water to turn water for sailing ships and for driving windmills, and the force of falling water to turn water wheels. Till this time, it would not be wrong to say that the sun was supplying all the energy needs of man either directly or indirectly and that man was using only renewable sources of energy.

HARDWARE DESCRIPTION



- Foot step mechanism
- Microcontroller
- Regulated Power Supply
- Crystal Oscillator
- Generator
- LDR (Light Dependent Resistor)
- High Power LED.
- LCD (Liquid Crystal Display)

[1]**Corresponding author**

Foot Step Mechanism

Figure 2.1(A)

Whenever foot force is applied on the setup shown in the figure, this force creates a mechanical energy which rotates the flywheel.This energy is given to a DC generator which converts mechanical energy to electrical energy.

Microcontroller

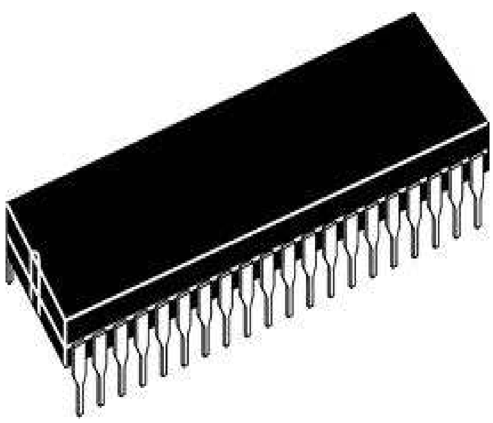


Figure 2.2(A)

Circumstances that we find ourselves in today in the field of microcontrollers had their beginnings in the development of technology of integrated circuits. This development has made it possible to store hundreds of thousands of transistors into one chip. That was a prerequisite for production of microprocessors, and the first computers were made by adding external peripherals such as memory, input-output lines, timers and other. Further increasing of the volume of the package resulted in creation of integrated circuits. These integrated circuits contained both processor and peripherals. That is how the first chip containing a microcomputer, or what would later be known as a microcontroller came about.

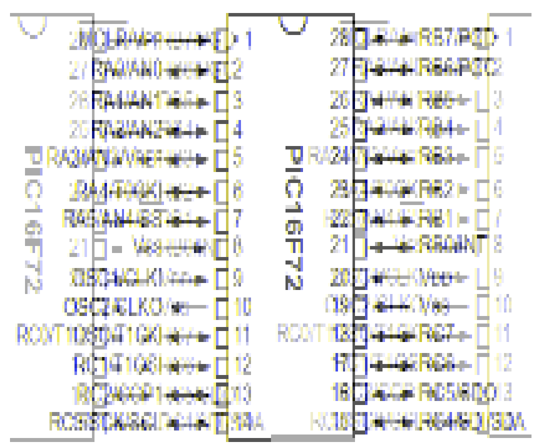
Microprocessors and microcontrollers are widely used in embedded systems products. Microcontroller is a programmable device. A microcontroller has a CPU in addition to a fixed amount of RAM, ROM, I/O ports and a timer embedded all on a single chip. The fixed amount of on-chip ROM, RAM and number of I/O ports in microcontrollers makes them ideal for many applications in which cost and space are critical.

The microcontroller used in this project is PIC16F72. The PIC families of microcontrollers are developed by Microchip Technology Inc. Currently they are some of the most popular microcontrollers, selling over 120 million devices each year.

Pin Description

PIC16F72 has a total of 28 pins. It is most frequently found in a DIP28 type of case but can also be found in SMD case which is smaller from a DIP. DIP is an abbreviation for Dual In Package. SMD is an abbreviation for Surface Mount

Devices suggesting that holes for pins to go through when mounting aren't necessary in soldering this type of a component.



Pins on PIC16F72 microcontroller have the following meaning:

There are 28 pins on PIC16F72. Most of them can be used as an IO pin. Others are already for specific functions. These are the pin functions.

1. MCLR – to reset the PIC
2. RA0 – port A pin 0
3. RA1 – port A pin 1
4. RA2 – port A pin 2
5. RA3 – port A pin 3
6. RA4 – port A pin 4
7. RA5 – port A pin 5
8. VSS – ground
9. OSC1 – connect to oscillator
10. OSC2 – connect to oscillator
11. RC0 – port C pin 0 VDD – power supply
12. RC1 – port C pin 1
13. RC2 – port C pin 2
14. RC3 – port C pin 3
15. RC4 - port C pin 4
16. RC5 - port C pin 5
17. RC6 - port C pin 6
18. RC7 - port C pin 7
19. VSS - ground
20. VDD – power supply
21. RB0 - port B pin 0
22. RB1 - port B pin 1
23. RB2 - port B pin 2
24. RB3 - port B pin 3
25. RB4 - port B pin 4
26. RB5 - port B pin 5
27. RB6 - port B pin 6
28. RB7 - port B pin 7

By utilizing all of this pin so many application can be done such as:

1. LCD – connect to Port B pin.
2. LED – connect to any pin declared as output.
3. Relay and Motor - connect to any pin declared as output.
4. External EEPROM – connect to I2C interface pin – RC3 and RC4 (SCL and SDA)
5. LDR, Potentiometer and sensor – connect to analogue input pin such as RA0.
6. GSM modem dial up modem – connect to RC6 and RC7 – the serial communication interface using RS232 protocol.

Program memory

Program memory has been carried out in FLASH technology which makes it possible to program a microcontroller many times before it's installed into a device, and even after its installment if eventual changes in program or process parameters should occur. The size of program memory is 1024 locations with 14 bits width where locations zero and four are reserved for reset and interrupt vector.

Data memory

Data memory consists of EEPROM and RAM memories. EEPROM memory consists of 256 eight bit locations whose contents are not lost during loosing of power supply. EEPROM is not directly addressable, but is accessed indirectly through EEADR and EEDATA registers. As EEPROM memory usually serves for storing important parameters (for example, of a given temperature in temperature regulators), there is a strict procedure for writing in EEPROM which must be followed in order to avoid accidental writing. RAM memory for data occupies space on a memory map from location 0x0C to 0x4F which comes to 68 locations. Locations of RAM memory are also called GPR registers which is an abbreviation for General Purpose Registers. GPR registers can be accessed regardless of which bank is selected at the moment.

Rectification

The process of converting an alternating current to a pulsating direct current is called as rectification. For rectification purpose we use rectifiers.

Rectifiers

A rectifier is an electrical device that converts alternating current (AC) to direct current (DC), a process known as rectification. Rectifiers have many uses including as components of power supplies and as detectors of radio signals. Rectifiers may be made of solid-state diodes, vacuum tube diodes, mercury arc valves, and other components.A device that it can perform the opposite function (converting DC to AC) is known as an inverter. When only one diode is used to rectify AC (by blocking the negative or positive portion of the waveform), the difference between the term diode and the term rectifier is merely one of usage, i.e., the term rectifier describes a diode that is being used to convert AC to DC. Almost all rectifiers comprise a number of diodes in a specific arrangement for more efficiently converting AC to DC than is possible with only one diode. Before the development of silicon semiconductor rectifiers, vacuum tube diodes and copper (I) oxide or selenium rectifier stacks were used.

Filtration

The process of converting a pulsating direct current to a pure direct current using filters is called as filtration.

Filters

Electronic filters are electronic circuits, which perform signal-processing functions, specifically to remove unwanted frequency components from the signal, to enhance wanted ones.

Introduction to Capacitors

The **Capacitor** or sometimes referred to as a Condenser is a passive device, and one which stores energy in the form of an electrostatic field which produces a potential (static voltage) across its plates. In its basic form a capacitor consists of two parallel conductive plates that are not connected but are electrically separated either by air or by an insulating material called the Dielectric. When a voltage is applied to these plates, a current flows charging up the plates with electrons giving one plate a positive charge and the other plate an equal and opposite negative charge this flow of electrons to the plates is known as the Charging Current and continues to flow until the voltage across the plates (and hence the capacitor) is equal to the applied voltage Vcc. At this point the capacitor is said to be fully charged and this is illustrated below. The construction of capacitor and an electrolytic capacitor are shown in figures 2.6(A) and 2.6(B) respectively.

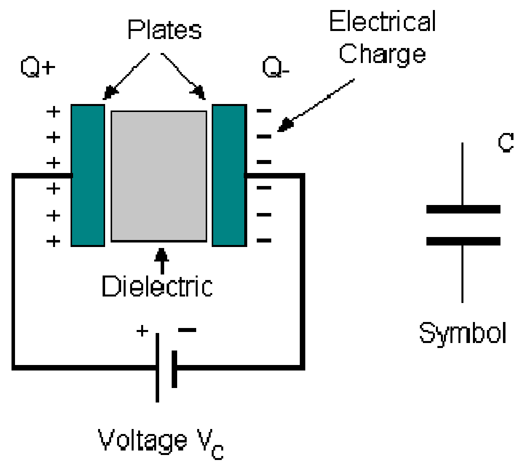


Figure 2.6(A): Construction Of a Capacitor

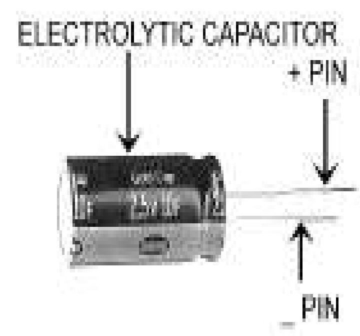


Figure 2.6(B): Electrolytic Capaticor

Units of Capacitance:

Microfarad (μF) 1μF = 1/1,000,000 = 0.000001 = 10^{-6} F

Nanofarad (nF) 1nF = 1/1,000,000,000 = 0.000000001 = 10^{-9} F

Pico farad (pF) 1pF = 1/1,000,000,000,000 = 0.000000000001 = 10^{-12} F

Regulation

The process of converting a varying voltage to a constant regulated voltage is called as regulation. For the process of regulation we use voltage regulators.

Voltage Regulator

A voltage regulator (also called a 'regulator') with only three terminals appears to be a simple device, but it is in fact a very complex integrated circuit. It converts a varying input voltage into a constant 'regulated' output voltage. Voltage

Regulators are available in a variety of outputs like 5V, 6V, 9V, 12V and 15V. The LM78XX series of voltage regulators are designed for positive input. For applications requiring negative input, the LM79XX series is used. Using a pair of 'voltage-divider' resistors can increase the output voltage of a regulator circuit.

It is not possible to obtain a voltage lower than the stated rating. You cannot use a 12V regulator to make a 5V power supply. Voltage regulators are very robust. These can withstand over-current draw due to short circuits and also over-heating. In both cases, the regulator will cut off before any damage occurs. The only way to destroy a regulator is to apply reverse voltage to its input. Reverse polarity destroys the regulator almost instantly. Fig: 2.7(A) shows voltage regulator.

Figure 2.7(A): Voltage Regulator

Resistors

A resistor is a two-terminal electronic component that produces a voltage across its terminals that is proportional to the electric current passing through it in accordance with

Resistors are elements of electrical networks and electronic circuits and are ubiquitous in most electronic equipment. Practical resistors can be made of various compounds and films, as well as resistance wire (wire made of a high-resistivity alloy, such as nickel/chrome). The primary characteristics of a resistor are the resistance, the tolerance, maximum working voltage and the power rating. Other characteristics include temperature coefficient, noise, and inductance. Less well-known is critical resistance, the value below which power dissipation limits the maximum permitted current flow, and above which the limit is applied voltage. Critical resistance is determined by the design, materials and dimensions of the resistor.

Resistors can be made to control the flow of current, to work as Voltage dividers, to dissipate power and it can shape electrical waves when used in combination of other components.

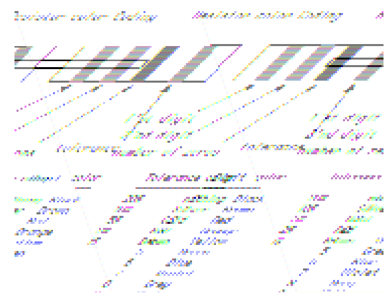


Figure 2.8(A): Resistor Fig 2.8(B): Color Bands In Resistor

REGULATED POWER SUPPLY

Introduction

Power supply is a supply of electrical power. A device or system that supplies electrical or other types of energy to an output load or group of loads is called a power supply unit or PSU. The term is most commonly applied to electrical energy supplies, less often to mechanical ones, and rarely to others. A power supply may include a power distribution system as well as primary or secondary sources of energy such as

- Conversion of one form of electrical power to another desired form and voltage, typically involving converting AC line voltage to a well-regulated lower-voltage DC for electronic devices. Low voltage, low power DC power supply units are commonly integrated with the devices they supply, such as computers and household electronics.
- Batteries.
- Chemical fuel cells and other forms of energy storage systems.
- Solar power.
- Generators or alternators.

Block Diagram

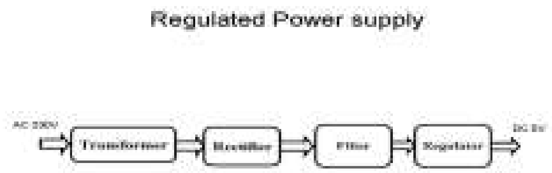


Figure 2.9(A) Regulated Power Supply

The basic circuit diagram of a regulated power supply (DC O/P) with led connected as load is shown in fig: 3.1.2(B).

Transformation

The process of transforming energy from one device to another is called transformation. For transforming energy we use transformers.

Transformers

A transformer is a device that transfers electrical energy from one circuit to another through inductively coupled conductors without changing its frequency. A varying current in the first or primary winding creates a varying magnetic flux in the transformer's core, and thus a varying magnetic field through the secondary winding. This varying magnetic field induces a varying electromotive force (EMF) or "voltage" in the secondary winding. This effect is called mutual induction.

If a load is connected to the secondary, an electric current will flow in the secondary winding and electrical energy will be transferred from the primary circuit through the transformer to the load. This field is made up from lines of force and has the same shape as a bar magnet.

If the current is increased, the lines of force move outwards from the coil. If the current is reduced, the lines of force move inwards.

If another coil is placed adjacent to the first coil then, as the field moves out or in, the moving lines of force will "cut" the turns of the second coil. As it does this, a voltage is induced in the second coil. With the 50 Hz AC mains supply, this will happen 50 times a second. This is called MUTUAL INDUCTION and forms the basis of the transformer.

The input coil is called the PRIMARY WINDING; the output coil is the SECONDARY WINDING. Fig: **3.1.2(C)** shows step-down transformer.

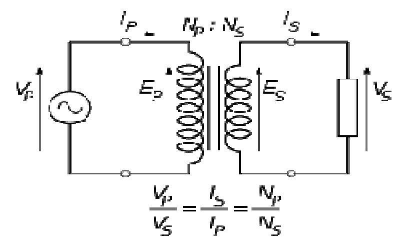


Figure 2.9(B): Step-Down Transformer

The voltage induced in the secondary is determined by the TURNS RATIO.

$$\frac{\text{primary voltage}}{\text{secondary voltage}} = \frac{\text{number of primary turns}}{\text{number of secondary turns}}$$

For example, if the secondary has half the primary turns; the secondary will have half the primary voltage.

Another example is if the primary has 5000 turns and the secondary has 500 turns, then the turn’s ratio is 10:1. If the primary voltage is 240 volts then the secondary voltage will be x 10 smaller = 24 volts. Assuming a perfect transformer, the power provided by the primary must equal the power taken by a load on the secondary. If a 24-watt lamp is connected across a 24 volt secondary, then the primary must supply 24 watts.

To aid magnetic coupling between primary and secondary, the coils are wound on a metal CORE. Since the primary would induce power, called EDDY CURRENTS, into this core, the core is LAMINATED. This means that it is made up from metal sheets insulated from each other. Transformers to work at higher frequencies have an iron dust core or no core at all.

Note that the transformer only works on AC, which has a constantly changing current and moving field. DC has a steady current and therefore a steady field and there would be no induction. Some transformers have an electrostatic screen between primary and secondary. This is to prevent some types of interference being fed from the equipment down into the mains supply, or in the other direction. Transformers are sometimes used for IMPEDANCE MATCHING.

We can use the transformers as step up or step down.

Step Up transformer

In case of step up transformer, primary windings are every less compared to secondary winding. Because of having more turns secondary winding accepts more energy, and it releases more voltage at the output side.

Step down transformer

Incase of step down transformer, Primary winding induces more flux than the secondary winding, and secondary winding is having less number of turns because of that it accepts less number of flux, and releases less amount of voltage.

CRYSTAL OSCILLATOR

Figure 2.10(A): Crystal Oscillator

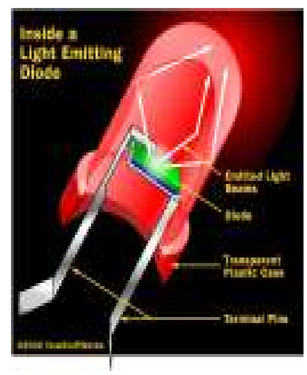
- An oscillator is an electronic circuit that produces a repetitive electronic signal.
- The maximum operating frequency of PIC Microcontrollers is 20 MHz
- PIC Microcontroller has internal 4 MHz internal oscillator
- Crystal oscillator is used in this project because of the fact that crystal is more stable to temperature than other types of oscillators.

GENERATOR

- In this project we are using a DC motor as generator.
- The linear mechanical movement is converted to angular (rotational) movement.
- We are also using a flywheel (mechanical device) used as a storage device for rotational energy.
- The DC generator is directly coupled to flywheel.
- The DC generator generates the voltage that can be stored in a rechargeable battery for further usage.

LED

A light-emitting diode (LED) is a semiconductor light source. LED’s are used as indicator lamps in many devices, and are increasingly used for lighting. Introduced as a practical electronic component in 1962, early LED’s emitted low-intensity red light, but modern versions are available across the visible, ultraviolet and infrared wavelengths, with very high brightness. The internal structure and parts of a led are shown below.



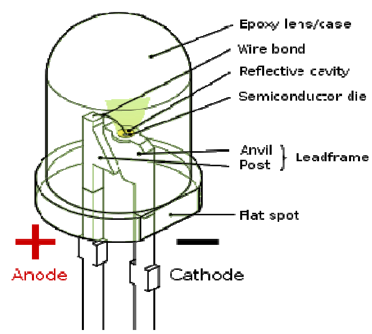


Figure 2.12(A): Inside a LED Fig. 2.12(B): Parts of a LED

Working

The structure of the LED light is completely different than that of the light bulb. Amazingly, the LED has a simple and strong structure. The light-emitting semiconductor material is what determines the LED's color. The LED is based on the semiconductor diode.

LED lights have a variety of advantages over other light sources:

- High-levels of brightness and intensity
- High-efficiency
- Low-voltage and current requirements
- Low radiated heat
- High reliability (resistant to shock and vibration)
- No UV Rays
- Long source life
- Can be easily controlled and programmed

Applications of LED fall into three major categories:

- Visual signal application where the light goes more or less directly from the LED to the human eye, to convey a message or meaning.
- Illumination where LED light is reflected from object to give visual response of these objects.

Generate light for measuring and interacting with processes that do not involve the human visual system.

SPRING

A typical spring is a tightly wound coil or spiral of metal that stretches when you pull it (apply a force) and goes back to its original shape when you let it go again (remove the force). In other words, a spring is elastic. I don't mean it's made from rubber; I mean that it has elasticity.

Depending on how a spring is made, it can work in the opposite way too: if you squeeze it, it compresses but returns to its original length when the pushing force is removed.

Springs are great for storing or absorbing energy. When you use a pushing or pulling force to stretch a spring, you're using a force over a distance so, in physics terms, you're doing work and using energy

Magnetic Spring

Spring using the repulsion force and attraction force by magnetism, as called by its type of function.

What are springs used for?

Open up a ballpoint pen (one of the ones with a button you click to retract the ball) and you'll find a spring inside. Look under a car and there are springs there too, helping the shock absorbers to smooth out the bumps in the road. There are springs in watches and clocks, as we've already seen. And there's a spring in a car speedometer (at least, one of the old-fashioned mechanical ones). Once you've started spring spotting, you'll find you can see springs everywhere.

Types of springs

Coil springs (like in pens): cylinders of wire wrapped around a circle of fixed radius. Spiral springs: are similar, but the coil gets progressively smaller as you reach the center; our paper spring is an example. The delicate hairspring that helps to keep time in a watch is another example of a spring like Torsion springs: work like the elastic in a catapult or an elastic band twisted repeatedly between your fingers: proper ones are made from stiff pieces of metal that twist on their own axis Leaf springs: are stacks of curved metal bars that support the wheels of a car or railroad truck and bend up and down to smooth out the humps and bumps.

Flywheel

A flywheel is a mechanical device with significant moment of inertia used as a storage device for rotational energy. Power storage devices for uses in vehicles.

It is a heavy metal disk at the rear end of the crankshaft; its inertia was used to smooth out speed fluctuations in the revolving crankshaft.

Flywheel

The **flywheel effect** is the continuation of oscillations in an oscillator circuit after the control stimulus has been removed. This is usually caused by interacting inductive and capacitive elements in the oscillator

Flywheel effect is used in **class C** modulation where efficiency of modulation can be achieved as high as 90%

Rack and Pinion

A **rack and pinion** is a type of linear actuator that comprises a pair of gears which convert rotational motion into linear motion. The circular pinion engages teeth on a linear "gear" bar–the rack. Rotational motion applied to the pinion will cause the rack to move to the side, up to the limit of its travel. For example, in a rack railway, the rotation of a pinion mounted on a locomotive or a railcar engages a rack between the rails and pulls a train along a steep slope.

The rack and pinion arrangement is commonly found in the steering mechanism of cars or other wheeled, steered vehicles. This arrangement provides a lesser mechanical advantage than other mechanisms such as recirculating ball, but much less backlash and greater feedback, or steering "feel". The use of a variable rack (still using a normal pinion) was invented by Arthur E Bishop,[1] so as to improve vehicle response and steering "feel" especially at high speeds, and that has been fitted to many new vehicles, after he created a specialized version of a net-shape warm press forging process to manufacture the racks to their final form, thus eliminating any subsequent need to machine the gear teeth.

Enclosed steering rack in an automobile

For every pair of conjugate involutes profile, there is a basic rack. This basic rack is the profile of the conjugate gear of infinite pitch radius.

A generating rack is a rack outline used to indicate tooth details and dimensions for the design of a generating tool, such as a hob or a gear shaper cutter.

Spur Gear Rack and Pinion Gears

Steel Gear Rack and Pinion

Usually available Ex-stock, can be supplied 1 pcs or 1000 pcs per month

Helical Gear Rack and Pinion Gears

- Pitch upto 20 Module/1.5 D.P.
- Face Widths up to 250 mm/9"
- Length upto 2500 mm/60"
- Made of Steel, Carbon Steel, Alloy Steel, Hardened and Tempered Steels, Case carburised, Case Hardened Steels, Cast Iron, Bronze, Aluminum, Hylam or as specified
- Standard and custom made as per Specifications, Drawing or Sample
- For Automotive and Industrial use

Required information for quotation of Gear Rack

- Material of Construction - Steel, Carbon Steel like C-45, Alloy Steel like EN 24, Bronze, Aluminum, Hylam,
- Teeth Specification - pitch, 2,3,4,5,6,8,10,12,16,20 module or DP
- Face Width
- Length
- Holding holes if any
- Quantity
- Any other requirement like Anodizing, hardening and tempering required etc

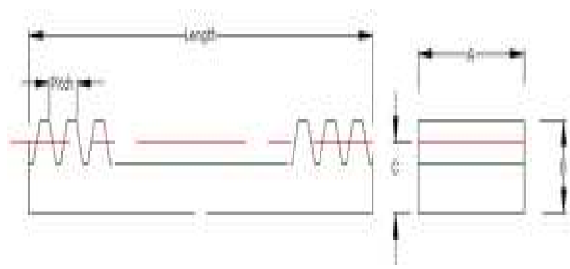
Spur gear teeth are manufactured by either involute profile or cycloidal profile. Most of the gears are manufactured by involute profile with 20° pressure angle. When two gears are in mesh at one instant there is a chance to mate involute portion with non-involute portion of mating gear. This phenomenon is known as INTERFERENCE and occurs when the number of teeth on the smaller of the two meshing gears is smaller than a required minimum. To avoid interference we can have undercutting, but this is not a suitable solution as undercutting leads to weakening of tooth at its base. In this situation Corrected gears are used. In corrected gears Cutter rack is shifted upwards or downwards.

There are two types of corrected gears:

1. S0 gearing (x1+x2=zero)
2. S gearing (x1+x2 not equal to zero)

Particular	Metric	Imperial
Max. (full depth)	20 mod	1DP
Max. Face Width	250 mod	10"
Max. Overall Width	500 mm	20"
Max. Height	300 mm	12"
Max. Length	2500 mm	
Tooth Pressure Angle	14 1/2˚, 20˚, 25˚	
ISO, AGMA and DIN	Full Depth and stub Spur or Helical to 45˚ PA	

Standard Gear Racks



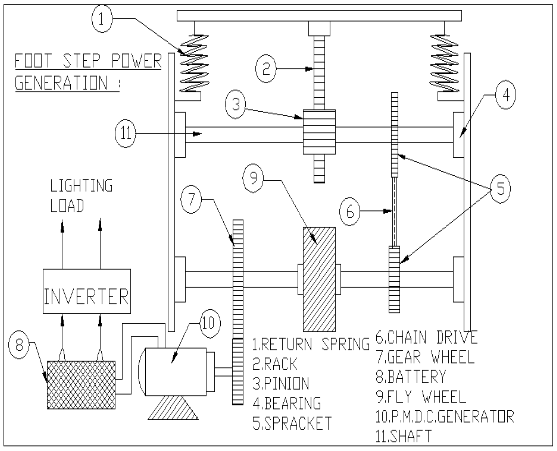
D.C. Motor

A dc motor uses electrical energy to produce mechanical energy, very typically through the interaction of magnetic fields and current-carrying conductors. The reverse process, producing electrical energy from mechanical energy, is accomplished by an alternator, generator or dynamo. Many types of electric motors can be run as generators, and vice versa.The input of a DC motor is current/voltage and its output is torque (speed).

DC Motor

WORKING PRINCIPLE

The complete diagram of the foot step power generation is given below. Only one step is inclined in certain small angle which is used to generate the power. The pushing power is converted into electrical energy by proper driving arrangement. The rack & pinion, spring arrangement is fixed at the inclined step. The spring is used to return the inclined step in same position by releasing the load. The pinion shaft is connected to the supporter by end bearings as shown in fig. The larger sprocket also coupled with the pinion shaft, so that it is running the same speed of pinion. The larger sprocket is coupled to the small cycle sprocket with the help of chain (cycle). This larger sprocket is used to transfer the rotation force to the smaller sprocket.



The smaller sprocket is running same direction for the forward and reverse direction of rotational movement of the larger sprocket. This action locks like a cycle pedaling action. The fly wheel and gear wheel is also coupled to the smaller sprocket shaft. The flywheel is used to increase the rpm of the smaller sprocket shaft. The gear wheel is coupled to the generator shaft with the help of another gear wheel. The generator is used here, is permanent magnet D.C generator. The generated voltage is 5Volt D.C.

PROJECT DESCRIPTION

In this chapter, schematic diagram and interfacing of PIC16F72 microcontroller with each module is considered**.**

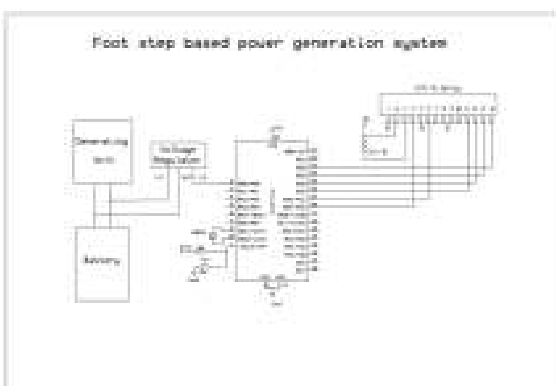


Figure 4(A): Schematic diagram of construction of Foot step based power generation system

The above schematic diagram of Foot step based power generation system using microcontroller explains the interfacing section of each component with micro controller. Crystal oscillator connected to 9th and 10th pins of micro controller and regulated power supply is also connected to micro controller and LED's also connected to micro controller through resistors.

The detailed explanation of each module interfacing with microcontroller is as follows:

Interfacing crystal oscillator and reset button with micro controller

Fig explains crystal oscillator and reset button which are connected to micro controller. The two pins of oscillator are connected to the 9th and 10th pins of micro controller; the purpose of external crystal oscillator is to speed up the execution part of instructions per cycle and here the crystal oscillator having 20 MHz frequency. The 1st pin of the microcontroller is referred as MCLR ie.., master clear pin or reset input pin is connected to reset button or power-on-reset.

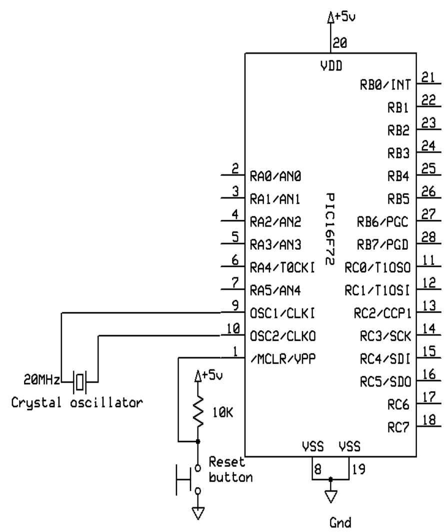


Figure 4.1 (A): crystal oscillator and reset input interfacing with micro controller

ADVANTAGES, DISADVANTAGES AND APPLICATIONS

Advantages

1. Conservation of Non Renewable energy sources.
2. Maximum output can be obtained.
3. Efficient and low cost design.
4. Low power consumption.
5. Power generation is simply walking on the step.

6. Power also generated by running or exercising on the step.
7. No need fuel input.
8. This is a Non-conventional system.

Disadvantages

1. Periodic Monitoring and Maintenance is required.
2. A drastic environmental change cannot be tolerated by the equipment.
3. Only applicable for the particular place.
4. Mechanical moving parts are high.
5. Initial cost of this arrangement is high.
6. Care should be taken for batteries.

Applications

1. This energy can be utilized for simple house hold appliances.
2. This energy can be stored and utilized as backup power supply mainly in industries.
3. Colleges.
4. Schools.
5. Cinema theatres.
6. Shopping complex .
7. Many other buildings.

CONCLUSIONS

The project "Foot step based power generation system" was designed such that to generate electrical power as non-conventional method by simply walking or running on the foot step. Non-conventional energy using foot step is converting mechanical energy into the electrical energy

Integrating features of all the hardware components used have been developed in it. Presence of every module has been reasoned out and placed carefully, thus contributing to the best working of the unit. Secondly, using highly advanced IC's with the help of growing technology, the project has been successfully implemented. Thus the project has been successfully designed and tested.

REFERENCES

The sites which were used while doing this project:

www.wikipedia.com

www.allaboutcircuits.com

www.microchip.com

www.howstuffworks.com

BOOKS REFERRED

Raj kamal –Microcontrollers Architecture, Programming, Interfacing and System Design.

Mazidi and Mazidi –Embedded Systems.

PCB Design Tutorial –David.L.Jones.

PIC Microcontroller Manual – Microchip.

Embedded C –Michael.J.Pont.