



e-ISSN: 2319-8753 | p-ISSN: 2347-6710

IJRSET

International Journal of Innovative Research in
SCIENCE | ENGINEERING | TECHNOLOGY

INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN SCIENCE | ENGINEERING | TECHNOLOGY

Volume 12, Issue 9, September 2023

ISSN INTERNATIONAL
STANDARD
SERIAL
NUMBER
INDIA

Impact Factor: 8.423

 9940 572 462

 6381 907 438

 ijrset@gmail.com

 www.ijrset.com

Design and Implementation of an AC/DC Power Harvesting Using Human Foot Step

Dr.K.Sampathkumar¹, Dr.A.Deepa², T.Ajay³, N.Elumalai⁴, S.Mahendiran⁵

Professor & Head, Department of Electrical and Electronics Engineering, Shree Sathyam College of Engineering and Technology, Sankari, Salem, India¹

Assistant Professor, Department of Chemistry, Shree Sathyam College of Engineering and Technology, Sankari, Salem, India²

UG Student, Department of Electrical and Electronics Engineering, Shree Sathyam College of Engineering and Technology, Sankari, Salem, India^{3,4&5}

ABSTRACT: In our modern world there is a lot of reserve places didn't have the electric power. But human travel that places also. At that time this project helps to needful their electric power. In this way to generate electricity that never runs out of power and is easy to carry, a human powered power-bank. In this project the design methodology of electrical power generation using leg movement. It's the travel gadget that recharges itself without any external electrical grid, using leg movement. Mechanical movement of leg is converted into electricity and stored in batteries for later use. It can be used to recharge cell phone, emergency flashlights, audio systems etc.

KEYWORDS: Battery, ac motor, Regulator, AC to DC converter.

I. INTRODUCTION

It is a device that utilizes mechanical energy converts it into electrical energy that can be used to charge a cell phone. It does not require any external electrical source. Also, by going for this alternative source of energy. We can reduce the human foot prints in earth as we are using human efforts instead of conventional electricity. The device uses a gear trail and intermediate gear for transformation of angular movement of leg into rotational movement of rotor which will then generate AC voltage with the help of coil placed around the magnetic rotor.

II. PROBLEM DOMAIN

In recent years, a lot of alternate means have been proposed to provide electrical energy. The means with renewable and sustainable features has attracted as increasing interest in last few years. Many human powered generators as well as human powered harvesting systems have been proposed in last few years, amongst them large amount uses piezoelectric disc to generate electricity, which results in very low voltage and current and is unable to charge a cell phone. Another method proposed uses a trail of gear mounted in a shoe to generate electricity, drawback of this method is it is unable to produce desired amount of voltage required to charge a device.

International Journal of Innovation Research in Science, Engineering and Technology, "Real Time Battery Charging System by Human Walking", 2 Feb (2015).

This article is explained used which converts vibrations of feet into electrical signals. Signal is in AC which is converted into DC and then boosted by using DC to DC boost convertor. For storing the electrical signal, „Lithium Batteries“ are used.

HarshPandey IshanKhan, ArpanGupta “Walkingbasedwearablemobilephonecharger&lighteningsystem” November(2014).

This article is explained the basic principle involved is the conversion of human mechanical power into electrical. This human energy is converted into electrical energy by the transducer.

Joydev Ghosh, Supratim Sen, Amit shah, samir Basak “Electric Power generation using foot step for urban area energy application” August (2013).

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

III. PROPOSED SYSTEM

In our proposed system consist of crank shaft, motor, rectifier, battery and converters. It mainly used for t harvesting power. It is getting power from human Footsteps.

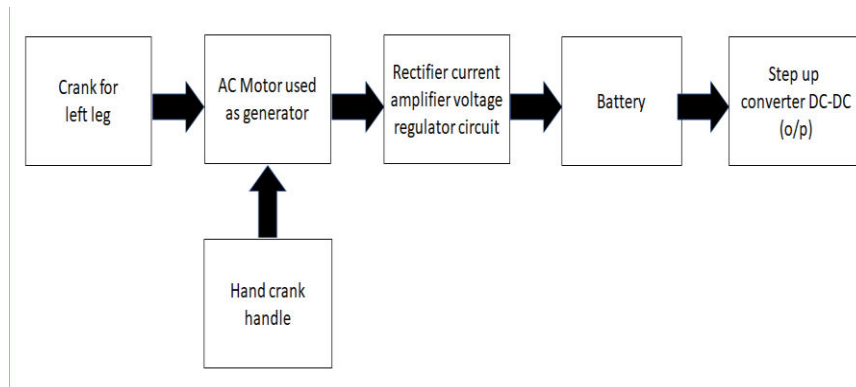


Fig.1 POWER HARVESTING

Operation

Human walking to crank for left leg to rotate the AC generator, the generator is mechanical energy is converting to AC electrical energy. The AC is converting to DC with help of rectifier circuit. The rectifier circuit output is variable dc. the variable dc is converting to fixed 5V dc output with help of Lm7805 voltage regulator. The 5V output is stored the battery. The battery to connected step up converter DC-DC it is step the voltage to load.

Crank for left leg

Essentially, human walking in the angular movement of force is converted to a rotational movement using crank and a trail of gears, which rotates the magnetic rotor placed in between copper coil which in return produces electricity. Gear trail helps to convert the slow movement of crank into a speedy rotation of rotor which helps in producing electricity.



Fig.2 Crank for left leg

Hand crank handle

Essentially, human hand force in the angular movement of force is converted to a rotational movement using crank and a trail of gears, which rotates the magnetic rotor placed in between copper coil which in return produces electricity. Gear trail helps to convert the slow movement of crank into a speedy rotation of rotor which helps in producing electricity.



Fig.3 Hand crank handle

AC to DC conversion

The circuit diagram consists of AC source, bridge rectifier, LM7805 and capacitor.

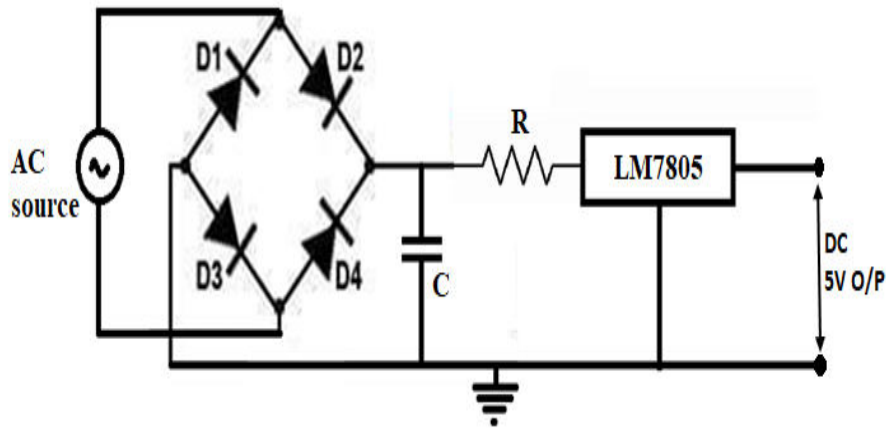


Fig.4 AC to DC conversion circuit

When supply is turn-off, at the time D2, D3 act as a forward's bias at the same time D1, D4 act as a reverse bias in the positive half cycle. When supply turn on the D1, D4 act as a forward bias at the same time D2, D3 act as a reverse bias in the negative half cycle. The rectifier is used to ac to dc converter. The variable dc voltage is converting fixed 5v with using of LM7805 voltage regulator.

Components

- AC motor
- Rectifier
- LM7805 Regulator
- Battery
- Step up converter

AC Motor

A synchronous generator is a synchronous machine which converts mechanical power into AC electric power through the process of electromagnetic induction. Synchronous generators are also referred to as **alternators** or **AC generators**. The term "alternator" is used since it produces AC power. It is called synchronous generator because it must be driven at synchronous speed to produce AC power of the desired frequency. A synchronous generator can be either single-phase or three-phase.



Fig.5 49TYD -500 AC Synchronous Motor

This 49TYD-500 AC Synchronous Motor. It is designed as a small size motor specifically for applications requiring precise timing such as timekeeping (clocks) and tape players. Although battery-power quartz-regulated clock are

widely available. This motor with motor with AC line operated variety offers better long-term accuracy over a period of months.

This is mainly due to power operators purposely maintaining the long-term accuracy of the frequency of AC distribution system. In case if it falls behind by a few cycle, they will make up the lost cycles of AC. So that clock lose no time. A synchronous electric motor defined as an AC motor, at a steady-state, the rotation of the shaft synchronized with frequency of supply current. This AC motor operates at voltage range 12V to 240V AC. 49TYD-500 synchronous AC Motor offers a max output torque of 68kgcm at a rated current of 100mA.

Moreover, this module operated at a wide range of applications in the field in the field of beverage machines, blenders, grills, ovens, office equipment, household appliance.

Rectifier Diode

The rectifier diode is a semiconductor component used to convert ac to dc current. During ac to dc, the conversion negative half cycle of ac is blocked, and the positive converted into dc



Fig.6 Diode

The rectifier diode has a PN junction which helps the current flow in one direction. These diodes are the main parts of power sources, rectifier circuits, and switching application.

LM 7805 voltage regulator

Voltage regulator like IC7805 belongs to the 78xx series ICs. In the 78xx series, xx represents the fixed output voltage value and 7805 is a fixed linear voltage regulator. Batteries provide a voltage of 1.2V, 3.7V, 9V, and 12V. This voltage is good for the circuits which voltage requirements are in that range. The regulated power supply in this regulator is +5V DC. The 7805 voltage regulator is a three-terminal voltage regulator IC.

Pin details are given below

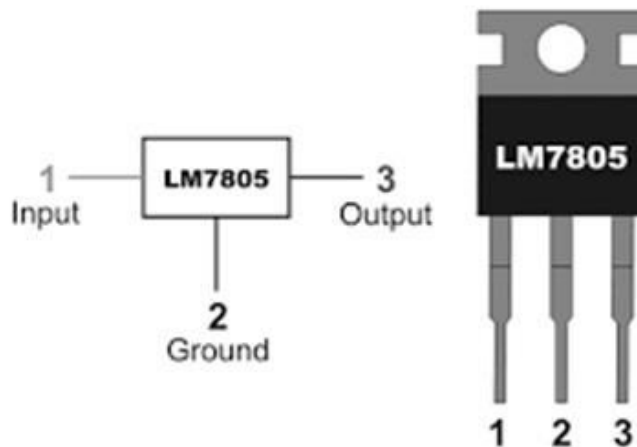


Fig.7LM 7805 voltage regulator

Pin1: Input: This is an input pin and the voltage range should be between 7V to 35V. an unregulated voltage is applied to this input pin for regulation. The pin will receive its maximum efficiency at 7.2V input

Pin2: Ground: Pin2 is the ground pin, it means the ground is connected to this pin. Input and output are common to it.

Pin3: Output: Pin3 is the output pin, where the regulated output is taken by this pin. It is about 5V (4.8V to 5.2V). Here Energy is exhausted in the form of heat In IC 7805 voltage regulator. The heat released is the input and output voltage difference. If the difference is less in between input voltage and output voltage, the heat generation will be low and if the difference between the input and output voltages are high, the more heat is generated. due to this heat malfunction occurs even without a heat sink.

Battery

A Lithium-ion or Li-ion battery is a type of rechargeable battery which uses the reversible reduction of lithium ions to store energy



Fig.8 Battery

The anode (negative electrode) of a conventional lithium-ion cell is typically graphite made from carbon. The cathode (positive electrode) is typically a metal oxide. The electrolyte is typically a lithium salt in an organic solvent.

Boost up converter

Power for the boost converter can come from any suitable DC source, such as batteries, solar panels, rectifiers, and DC generators. A process that changes one DC voltage to a different DC voltage is called DC to DC conversion.

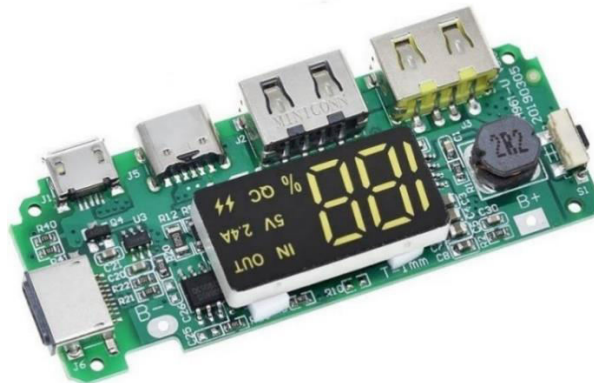


Fig.9 Boost up converter

A boost converter is a DC to DC converter with an output voltage greater than the source voltage.

IV. IMPLEMENTATION

The device works on basis of induction of motor. An induction generator or asynchronous generator is a type of alternating current electrical generator that uses the principle of induction motors to produce power. Induction generator operates by mechanically turning their rotor faster in synchronous speed. Regulator induction motor usually can be

used as a generator without any internal modification.



Fig.10AC generator

In the device angular movement of knee joint is converted to a rotational movement using crank and a trail of gears, which rotates the magnetic rotor placed in between copper coil which in return produces electricity. Gear trail helps to convert the slow movement of crank into a speedy rotation of rotor which helps in producing electricity. According to 'FARADAYS' law of 'Electro magnetic induction' for the cutting flux by coil there will be some current flow measured from the copper wire switch is AC by nature. This AC current is converted into DC using rectifier.

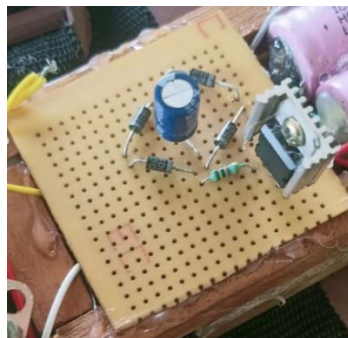


Fig.11Rectifier circuit

Circuit, after this conversion it is supplied to Darlington pair of transistors to increase the current, after current amplification the voltage is then regulated to 5 volts using LM7805 IC & then fed to battery for storage purpose. This electricity can be later used to charge a cell phone, mp3 player, or power a flash light.

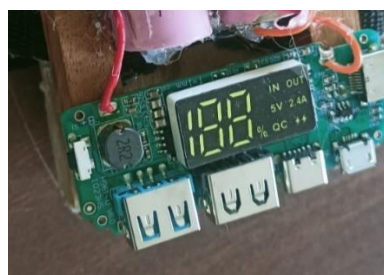


Fig.12 Step up converter (DC-DC)

For a single step leg movement device generates about 30 volts AC, this AC voltage is rectified through a rectification circuit using four diodes assembly which results in fluctuating 1-10volts DC, because of the back and forth movement of a single leg. To overcome this problem, another rectified 10 volts from other leg device is combined this results to a total of 6-8volts continuous DC voltage. Further this voltage is supplied to Darlington amplification circuit followed by voltage regulator LM7805 ic to limit the output voltage to 5volts dc, further this voltage is used to charge batteries.



V. EXPERIMENTAL RESULTS

The table 1- is obtained for battery charging time and voltage level for different levels.

Table 1-Batterycharging time for walking conditions.

Batterycharged (V)	Timetaken(m)
0.06	5
0.12	10
0.18	15
0.24	20

Table2

We have to generate the power in both ways. (Hand and legs). **Table – 2 is obtained the power generate by hand.**

Battery Charged in (V)	Time taken in (Minutes)
0.12	5
0.24	10
0.35	15
0.47	20

Table3 isobtained by power percentage charged and time in minutes.

Percentage charged(%)	Time taken in minutes
5	4
10	8
15	13
20	18



VI. CONCLUSION

The device is working on electromagnetic induction principle, design and implemented successfully. The main application of our device is to charge the all-electronic gadgets and various applications. Here we had chosen Li-ion battery for storing the energy, because its performance and efficiency is more. This Li-ion battery can be used for various equipments, such as a cell phone, audio systems, emergency flash lights etc. The overall experimental results have shown that the proposed method can preserve the size and makes our technique more secure and efficient

REFERENCES

1. HarshPandey, IshanKhan, ArpanGupta "Walking based wearable mobile phone charger & lightning system" November 2014, vol.3, No.14, pp.407-411, 2014
2. Joydev Ghosh, Supratim Sen, Amit shah, samirBasak "Electric Power generation using foot step for urban area energy application" August 2013 Vol.7, No.11, PP.1367-1369, 2013
3. Y.H. Kim, D.J. Kim and K. Wachter "A study of mobile user engagement (MOEN): Engagement motivation, perceived value, satisfaction, and continued engagement intention," *decis. Support syst.*, Vol.56, PP.361-370, 2013
4. UshaTiwari, MonikaJain, MohitGupta "Mobile charger via walk" December Vol.3, No.14, PP.407-411, 2011
5. VigneswaraRaoGannapathy "Battery powered and solar powered wireless sensor node" January Vol.10, NO. 2, PP.671-677, 2015



INNO SPACE
SJIF Scientific Journal Impact Factor
Impact Factor: 8.423



ISSN INTERNATIONAL
STANDARD
SERIAL
NUMBER
INDIA



INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN SCIENCE | ENGINEERING | TECHNOLOGY

9940 572 462 **6381 907 438** **ijirset@gmail.com**



www.ijirset.com

Scan to save the contact details