



Design and Fabrication of Mechanical Footstep Power Generator

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DESIGN AND FABRICATION OF MECHANICAL FOOTSTEP POWER GENERATOR

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Abstract

Man has needed and used energy at an increasing rate for the sustenance and well-being since time immemorial. Due to this lot of energy resources have been exhausted and wasted. Proposal for the utilization of waste energy of foot power with in human locomotion is very much relevant and important for highly populated countries like India where the railway stations, temples etc., are overcrowded all round the clock. In this project we are converting non-conventional from just walking foot step into electrical energy. This project uses simple drive mechanism such as rack and pinion assembly. The control mechanism carries the rack & pinion, and D.C generator to output.

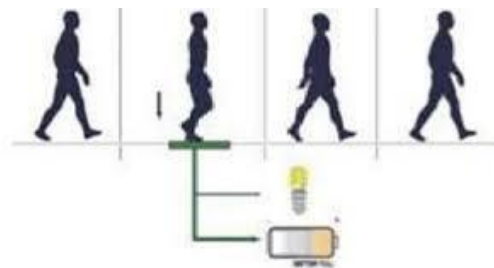
Keywords :

foot step power generation,
non conventional power,
rack & pinion power generation,
electricity generator.

I. INTRODUCTION

For an alternate method to generate electricity there are number of methods by which electricity can be produced, out if such methods foot step energy generation can be an effective method to generation can be an effective method to generate electricity.

Walking is the most common activity in human life. When person walks he losses energy to the road surface in form of impact, vibrations, sound etc., due to transfer of his weight to the road surface through foot falls on the ground doing 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.



In India, places like roads, railway stations, bus stands, are all over crowded and millions of people move round the clock. As a result large amount of power can be obtained with the use of this promising technology. This process involves number of simple setup that are installed under the walking platform. When people walk on this platform their body weight compresses the setup which rotates a dynamo or Sanyo coil and current produced is stored in dry battery. To reduce the external compression, a responsive subflooring system is installed. And while the power producing platform is over crowded with moving population, energy is produced at larger levels. Greater movement of people will generate more energy.

II. LITERATURE REVIEW

“Power Generation in Automobile Suspension System” by C. Nithiyesh Kumar, K.Gowtham, M.Manikandan, P.Bharathkanna, T. Manoj Kumar

In this research paper author studied three methods of foot step power generation namely piezoelectric method, rack and pinion method and fuel piston method comparatively and found that the rack and pinion mechanism is more efficient with moderate cost of operation and maintenance. [1]

“Power generation through step” by Vipin Kumar Yadav¹, Vivek Kumar Yadav¹, Rajat Kumar¹, Ajay Yadav

In these research paper authors used equipment with following specification: Motor Voltage:10 volt Type: D.C. Generator, RPM:1000 rpm, Gear 1-Mild Steel, No. of teeth:59(big gear),No. of teeth:36(small gear),Type: Spur Gear, No. of gear used:2 Spring 1-Load bearing capacity:60-90 kg, Mild Steel, Total displacement:5 inch, Bearing 1-Type: Ball bearing, Bearing no.N35,Shaft 1-Diameter: 15 mm- Material: Mild steel author concluded that with these method energy conversion is simple efficient and pollution free. [2]

“POWER GENERATION FROM STEPS” by Ramesh Raja R, Sherin Mathew

This research paper attempts to show how energy can be tapped and used at a commonly used floor step. The usage of steps in every building is increasing day by day, since even every small building has some floors. A large amount of energy is wasted when we are 216 stepping on the floors by the dissipation of heat and friction, every time a man steps up using stairs. There is great possibility of tapping this energy and generating power by making every staircase as a power generation unit. The generated power can be stored by batteries, and it will be used for slighting the building. [3]

III.COMONENT AND ASSEMBLY

The footstep arrangement is used to generate the electric power. Now a day’s power demand is increased, so the footstep arrangement is used to generate the electrical power in order to compensate the electric power demand. In this arrangement the mechanical energy is converted into electrical energy.

This section is constructed by of rubber or other material which is placed within the surface areas. This section is mainly placed in the crowd areas. This footstep arrangement is attached with spring section.

Footstep section consists of

1. Frame

Frame is the foremost supportive element in the system. The frame needs to endure all the heaviness of the exploratory setup. The power applied on the framework is conveyed to the four legs.



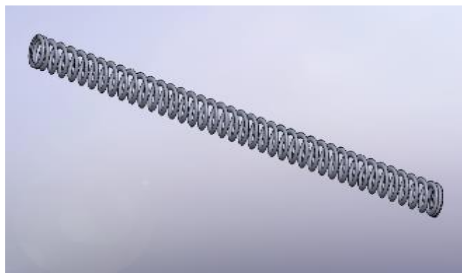
Base Assembly



Upper Assembly

2.Spring

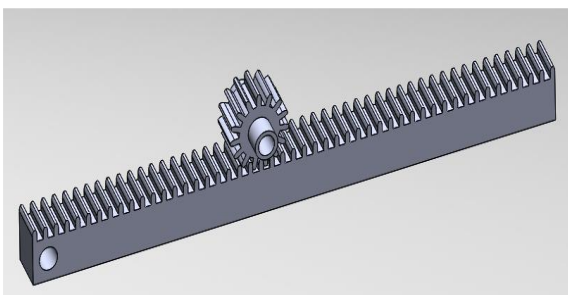
A spring is characterized as a versatile body, whose capacity is to twist when stacked and to recuperate its unique shape when burden is expelled. There are many types of springs but here we used a helical compression spring and there are four springs used as our requirement.



Spring

3.Rack and pinion

The gear of a shaft meshes externally and internally with gear in a straight line. Such type of gear is called rack and pinion gear. The straight line gear is called a rack and the circular wheel is called pinion



Rack & pinion

Specification of rack

material	Cast iron
Module	1.5mm
Cross section	75×25mm

Specification of pinion

material	Cast iron
Outside diameter	75mm
Circular pitch	4.7mm
Tooth depth	3.375mm
Module	1.5mm
Pressure angle	21
Pitch circle diameter	72mm
Circular tooth thickness	2.355mm
Fillet radius	0.45mm
Clearance	0.375mm

4. Flywheel

A flywheel utilized in machines fills in as a repository which stores vitality amid the period when the supply of vitality is more than the necessity and discharges it amid the period when the prerequisite of vitality is more than supply.

5. Bearing

A bearing is a machine component which bolster another moving machine component (known as diary). It allows a relative movement between the contact surfaces of the individuals, while conveying the heap. A little thought will demonstrate that because of the relative movement between the contact surfaces, a specific measure of intensity is squandered in conquering frictional obstruction and if the scouring surfaces are in direct contact, there will be quick wear. So as to lessen frictional obstruction and wear and now and again to divert the warmth produced, a layer of liquid (known as ointment) might be given. The oil used to isolate the diary and bearing is generally a mineral oil refined from oil, however vegetable oils, silicon oils, oils and so forth., might be utilized.

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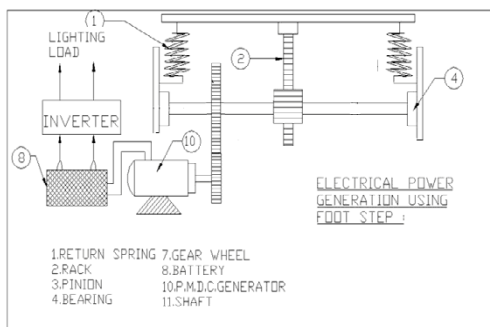


6. Inverter

It's an electric device that convert the direct current (DC) into alternating current (AC). The design of specific circuitry depends by the input voltage, output voltage, frequency and overall power handling capacity. The inverter does not provide power but the power is provided with the help of DC source.

7. Battery

An electric battery is a device consisting of one or more electromechanical cells that convert stored chemical energy into electrical energy. Every cell contains a positive terminal or cathode and a negative terminal or anode. Electrolytes allow ions to move between the electrode and terminal, which allows current to flow out of the battery to perform work.



IV. WORKING PROCESS

I. When a person moves from a foot step power generation system the plates move downward direction due to force is applied on the plate by virtue of impressing on the plate the force spring gets compressed.

II. The rack here moves vertically downward.

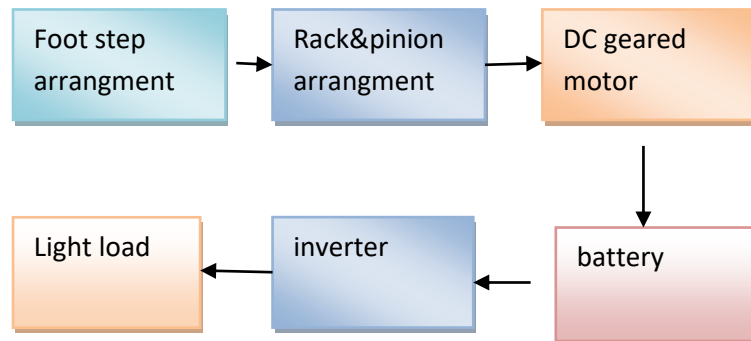
III. When the rack moves pinion will have engaged with the rack gear results in circular motion of the pinion gear.

IV. For one full compression the pinion moves 1 half circle.

V. When the force will have removed on the plate the pinion reverses and moves another half circle.

VI. The dynamo attached to the pinion hence result in the sinusoidal wave form (for single dynamo).

VII. Then, in this result energy produced will stored on battery for used.



V. CALCULATION & RESULT

Let us consider,

The mass of a body = 60 Kg (Approximately)

Height of spring = 6 cm

∴ Work done = Force x Distance

Here,

Force = Weight of the Body

= 60 Kg x 9.81

= 588.6 N

Distance traveled by the body = Height of the spring

= 6 cm

= 0.06 m

∴ Output power = Work done/Sec

= (588.6 x 0.06)/60

= 0.5886 Watts

(For One pushing force)

VI. CONCLUSION

1. The project "POWER GENERATION USING FOOT STEP" is successfully tested and implemented which is the best economical, affordable solution to common people.

2. Footstep power generation system produces electricity by utilizing energy which is wasted through walking. Mechanism like rack and pinion and piezo-electric material are integrated to produce desired output. Cost of electricity generation solely depends upon the initial cost, maintenance cost and life of system. Maximum advantage of this system can be taken if installed in highly dense area.

3. Implementing this system, we can easily reduce our dependency on the conventional sources of energy, thus can be considered beneficial from that point of view.

4. In energy crises facing countries where the load shading of electricity are due to the shortage of energy, this foot step power generation system is best method to produce energy and the output of electricity production is increased by increasing the size of foot step power generation system. As compared to other energy producing system the cost of this system is less.

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