International Journal of Advances in Engineering and Management (IJAEM)
Volume 3, Issue 6 June 2021, pp: 937-941 www.ijaem.net ISSN: 2395-5252

Advanced Footstep Power Generation System

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Submitted: 25-05-2021 Revised: 01-06-2021 Accepted: 05-06-2021

ABSTRACT: - In this project we are producing electrical power as non-conventional method by simply walking over piezoelectric sensors. Non-conventional energy system is very indispensable at this time for our nation. Non-conventional energy using foot step needs no fuel input power to create the output of the electrical power. This project uses simple drive mechanism such as rack and pinion assembly and by using piezoelectric transducers.

For this project the transformation of the force energy in to electrical energy. The control mechanism carries the rack & pinion, D.C generator. We have deliberated the numerous applications and further possibilities also. So this project is executed to all foot step, the power generation is very high. The preliminary cost of this arrangement is high.

KEYWORD: Power Generation,Footstep,Store Energy

I. INTRODUCTION

The deployment of different clean energy system is a vital strategy to accomplish environmental sustainability. Walking is also known as ambulation that is a central and common motion for human in everyday life.

The interaction between human feet and ground surface are created during the walking. The forces experienced by human feet upon landing on the ground can create renewable energy known as kinetic energy. This energy can be converted into electricity through a footstep power generator.. One of the paramount challenges in scheming the footstep power generators with piezoelectric transducer is the selection of suitable ferroelectric material because it administers the efficiency of transforming kinetic energy to electricity.

II. LITERATURE REVIEW

"Power generation in automobile suspension system"
byC.Nithiyeshkumar,K.Gowtham,M.Manikandan,P. Bharathkanna, T.Manoj Kumar.

In this study the author premeditated three approaches of foot step power generation namely piezoelectric method, rack and pinion method and fuel piston method comparatively and found that the rack and pinion apparatus is more competent with reasonable cost of operation and conservation.

[2] “Generation of electricity from Foot Step Using Rack and Pinion Mechanism” by Md.Azhar, ZitenderRajpurohit, Abdul Saif, NallaAbhinay, P.SaiChandu

In this study authors used controlled 5V power, 500mA power supply. Bridge type full wave rectifier is used to resolve the ac output of secondary of 220/6V step down transformer. A rack and pinion may be a sort of linear actuator including a pair of gears which convert rotational motion into linear motion. The “pinion" engages teeth on the rack. In this paper, since the power generation using foot step get its energy supplies from Non-renewable source of energy. There is no need of power from outer sources (mains) and there is significantly less pollution in this source of energy. It is very useful to the places like all roads and also as all quite foot step which is employed to supply the non-conventional energy like electricity

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

In this study 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, low-carbon steel ,Total displacement:5 inch, Bearing 1- Type: needle bearing , Bearing no.N35,Shaft 1- Diameter: 15 mm- Material: low-carbon steel author concluded that with these method energy conversion is simple effective and pollution free

III. RESEARCH GAP

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Alot of interesting researches have been conducted in this particular field and most of them are very promising

IV. OBJECTIVE

Footsteps are used for the assembly of electric power . Electrical energy produced by footstep is quite enough. Few methods are going to be described like steps of fly and kit wheel method for generating power in these step piezo plates also are used.

V. METHODOLOGY

1. The transformation of energy from mechanical into electrical is done to organize the electrical devices.
2. Electrical system is arranged effectively to transfer mechanical energy into electrical energy in proper manner.
3. Piezo is couple with the spring and by the assist of sheet arrangement is done by this technique; power will be generated by the force applied by the spring to vibrate piezo.
4. 6 volt battery of lead acid is used to store rectified voltage passed through battery charger circuit produce by the footstep.
5. Invertor and battery are linked. Inverter is design that converts 6 volts DC into 220 AC.
6. Finally, ac output voltage is used for lightening up energy saver as well as it may also be used for charging the battery of laptops; also charge the handset and can be used for many other home appliances.
7. If more output is needed increase the quality and ability of the inverter and battery also use more steps for more energy

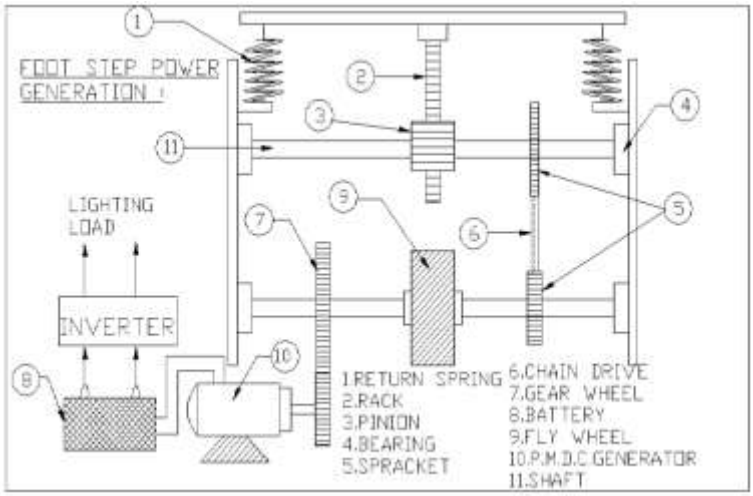

Fig-1:Flow Diagram

VI. COMPONENTS / HARDWARES

Various components used in are projects are as follows-:

- Piezoelectric Crystal
- Rack & Pinion
- Rechargeable Battery
- MultiMate
- Generator
- Spring
- Wooden Slab

The detail description of various components which are used in making of the project is illustrated below-

PIEZOELECTRIC CRYSTAL

Piezoelectricity is the electric charger that accumulates in certain solid materials (such as crystals, certain ceramics, and biological matter such as bone, DNA and various proteins) in response to applied mechanical stress. The word piezoelectricity means electricity resulting from pressure. It is derived from the Greek piezo, which means to squeeze or press, and electric or electron, which means amber, an ancient source of electric charge. Piezoelectricity was discovered in 1880 by French physicists Jacques and Pierre Curie.

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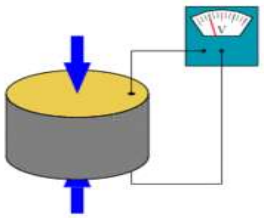

Fig-2: Piezometer Crystal

RACK AND PINION

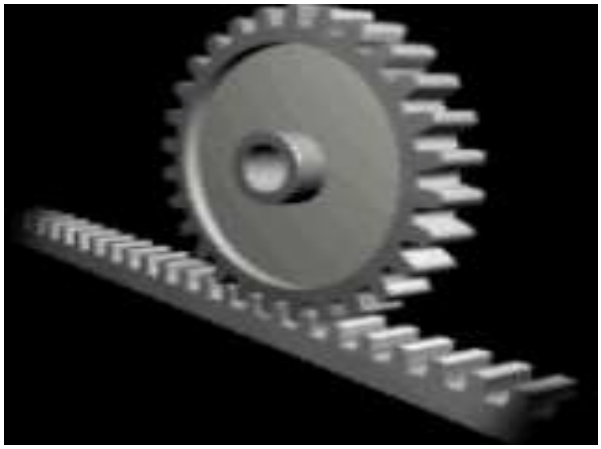

Fig-3: Rack and Pinion

A rackandpinion is a pair of gears which convert rotational motion into linear motion. The circular pinion engages teeth on a flat 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.

GENERATOR

The generator is like an electric motor in reverse. Instead of applying electricity to it to make it spin, when you spin it, it makes electricity. It does this by spinning a series of windings of fine wire (called the armature) inside of a fixed magnetic field by connecting them to a belt and pulley arrangement on the engine. As the armature is spun by the rotation of the belt and pulley, it gets a current and voltage generated in those windings of wire. That current and voltage will be directly proportional to the speed that the armature spins and to the strength of the magnetic field. If you spin it faster, it makes more and if you make the magnetic field stronger it makes more current. The speed of the spinning is controlled by the speed of the engine - that's why you need to rev the engine up to help charge the battery faster

SPRING

A spring is a flexible elastic object used to store mechanical energy. Springs are usually made out of hardened steel. Small springs can be wound from pre-hardened stock, while larger ones are made from annealed steel and hardened after fabrication. Some non-ferrous metals are also used including phosphor bronze and titanium for parts requiring corrosion resistance and beryllium copper for springs carrying electrical current (because of its low electrical resistance).

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Fig-4: Spring

Table No-1

SPECIFICATION OF MATERIAL

SR.NO.	MATERIAL	SPECIFICATION	COST IN RUPPES
1	Piezometer transducer	3v each	100
2	Rack &Pinion	10 inch(thickness)	600
3	Rechargeable battery	6v	300
4	Multimeter		400
5	Belt	2mm(thickness)	250
6	Generator	12v- DC	1100
7	Springs	6inch(thickness)	350
8	Wooden Slab	6mm (thickness) each	100

VII. CALCULATION FOR OUTPUT

When a force is applied on piezo material, a charge is generated across it. Thus, it can be assumed to be an ideal capacitor. Hence, all equations governing capacitors can be applied to it. In this project, on one tile, we connect 3 piezo in series and 10 such series connections are connected in parallel.

Thus when 2 piezoelectric discs are connected in series, its equivalent capacitance becomes 1/Ceq = 1/C1 + 1/C2

We know that, Q = C x V So, C = Q/V Veq/Q = V1/Q + V2/Q +

Thus, Veq = V1 + V2

Now it can be seen that the net voltage generated in series connection is the sum of individual voltages generated across each piezoelectric disc.

When output voltage from 1 piezo disc is 13V; then,

Veq = 13+13 = 26 Volts

Thus the maximum voltage that can be generated across the piezo tile is around 26V.

Power = Voltage x Current

Here, when the foot is depressed due to the applied loadon the footsteps the calculated power is as follows.

For example one step of 20kg of load applied on the footsteps, thegenerated voltage is 2.6V and the average currentproduced is 12milliamps.

Power = 2.6 x 0.012 = 0.0312

Power generated per hour is0.0312 x 3600 = 112.3Watts.

Thus, the obtained power for continuous load applied onthe footsteps for one hour is 112.3Watts.

CHARGING TIME

The entire energy that is produced when the load isapplied on the footsteps is stored in a storage device calledBATTERY. So, it is taken as important criteria to determinethe charging time taken by the battery. In this project thebattery is used with the battery rating of 1.3AH (ampere/hour).

Charging Time=BatteryRating/ChargingCurrent

BATTERY BACKUP TIME

Battery Backup Time=Battery Ratting/Load Applied

VIII. RESULT

8 Piezometer sensors are used in a square feet. There are diffrent steps in piezo sensor power generating, we get a minimum voltage of 1 Volt per step and maximum voltage 10.5 V per step we

take as an average weight of 50 KG pressure from a particular person. Taking as an example step of 50 KG weighted person, hence the average calculation is : to increase 1V charge in the batter it takes 800 steps. so, 800*12 = 9600 steps to increase 12 V in the battery. for this we have to implement our project in populated areas where footstep as source will be available, an average we take 2 steps in a second. and for 9600 steps we need 4800 seconds that is 80 mins. (approximately)

IX. CONCLUSION

In concluding our project's words, since the requirment of the power generation using footstep is the Non-renewable source of energy. There is less pollution and no need of power from the mains. It is basically usefull for to places around the roads and as well as all kind of footstep which is used to generate the Non-conventional energy just like electricity.

The same arrangement is used which helps in extending this project and construct in the footstep or speed breakers so that it increase the power production rate by putting it or fixing school, college, mall and etc.

the undertaken of this project is effectively tried and actualized which is good consevative, reasonable answer for an average citizens of our country.

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