POWER GENERATION BY FOOT STEPS USING RACK AND PINION ARRANGEMENT

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Abstract - *Now a day's energy and power are the one of the basic necessities regarding this modern world. In this project we are generating electrical power as non-conventional method by walking on the footsteps. Non-conventional energy system is very essential at this time to developing nations like India, China etc. Non-conventional energy using footsteps needs no fuel input power to generate the output. In this project the conversion of mechanical energy into electrical energy is done by using simple drive mechanisms such as rack and pinion assembly and chain drive mechanism.*

Key Words: Footsteps, Conventional Energy, Non-conventional energy system.

1. INTRODUCTION

Proposal for the utilization of waste energy of foot power with human locomotion is very much relevant and important. Man has needed and used energy at an increasing rate for his sustenance and well-being 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. This process involves number of simple setup that is installed under the walking platform. When people walk on this platform their body weight compresses the setup which rotates a dynamo and current is produced. The power producing platform is overcrowded area with moving population, energy is produced at larger levels. Greater movement of people will generate more energy. This whole human energy being wasted if can be made possible for utilization it will be great invention and power producing platform will be very useful energy sources in crowded countries.

2. OBJECTIVES

In this project we are converting Mechanical energy into Electrical energy. We are trying to utilize the wasted energy in a useful way. By using Rack and Pinion arrangement we are converting to and fro motion of the steps into rotational motion of the dynamo.

In first foot step we are using rack and pinion arrangement directly to rotate the dynamo. But in second step we are using chain drive mechanism to obtain better efficiency.

Through Dynamo the rotational energy is converted into electrical energy. This electrical energy output will be shown by glowing the LEDs.The output power is expected to be 3 to 4V in prototype.

3. GENERAL CONSIDERATIONS

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 crowed areas. This footstep arrangement is attached with spring section.

Footstep section consists of

- Springs
- Gearwheel arrangement
- Rack and Pinion Section
- Chain drive Mechanism
- Coupling section
- Dynamo
- LEDs

The rack & pinion, spring arrangement is fixed at the inclined step. The spring issued to return the inclined step in same position by releasing the load. The pinion shaft is connected to the supporter by end bearing. The larger sprocket also coupled with the pinion shaft, so that it is running at the same speed of piston. The larger sprocket is coupled to the small cycle sprocket with the help of chain.

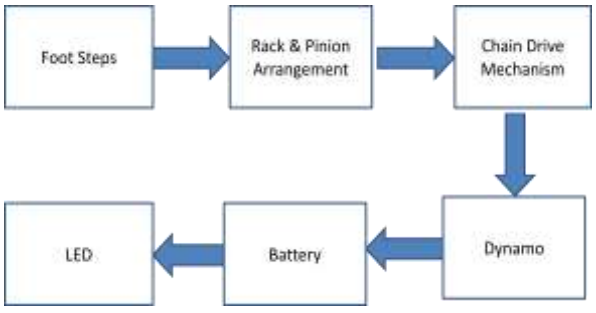

Fig.1 Block diagram

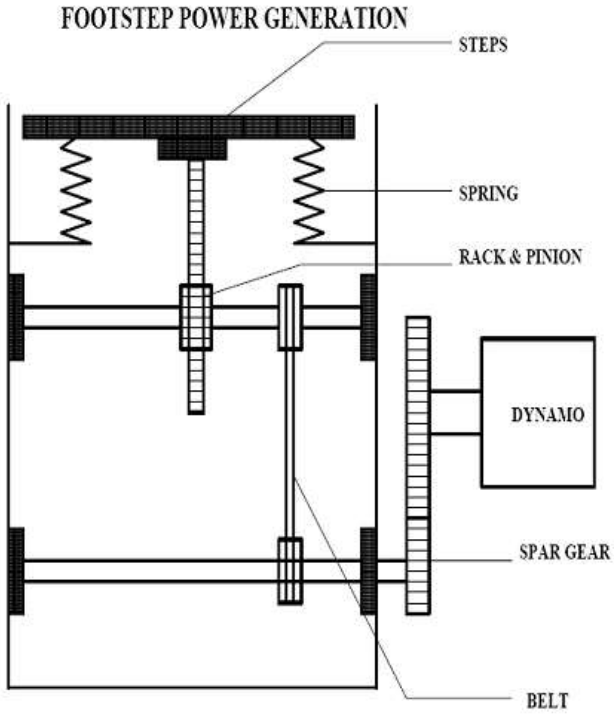

Fig.2 General design

4. WORKING PRINCIPLE

The General design of the foot step power generation is given in fig.4.2. In this arrangement we are using two steps. The rack & pinion, spring arrangement is fixed below the steps. We are using four springs foe each step. The spring is used to return the step in same position by releasing the load. The rack is coupled to the foot step.

In the second step, the Rack is connected to the foot steps. From Rack a shaft is provided in which the larger sprocket lies. The larger sprocket is coupled with Rack, so that it is running at the same speed of Rack. The larger sprocket is coupled to the smaller sprocket below in the other shaft with the help of chain (cycle). This larger sprocket is used to transfer the rotation force to the smaller sprocket. A gear is provided there also. The smaller sprocket is running same direction for the forward and reverse direction of rotational movement of the larger sprocket. It running at same speed also.

This action locks like a cycle pedaling action. The gear wheel which is provided in smaller sprocket is coupled to the Dynamo. The dynamo capacity used here is12V. From the dynamo the wires are taken. These wires are connected to a LEDs, to show the output power. Here the chain drive mechanism rotates only in single direction(arrangement is made for that).In the first step the foot steps is directly connected to the Rack & pinion arrangement. Here chain drive mechanism is not shown. To the pinion shaft dynamo is provided and LEDs are coupled to it. Thus Mechanical energy is converted in Electrical energy.

Table:1. Standard Proportions of Gear Systems

Sl.	Particulars	14 ½º Composite or full depth in volute system	20ºfull depth involute system
1	Addendum	1m	1m
2	Dedendum	1.25m	1.25m
3	Working Depth	2m	2m
4	Minimum total depth	2.25m	2.25m
5	Tooth thickness	1.5708m	1.5708m
6	Minimum clearance	0.25m	0.25m

5. CONCLUSION

This project can be handled in various ways to make the best use of it. There is many more extension that can be made to this project. Generators of more load capacity can be used to get more power.

Although the power generation is little less in this project. It tries to make use of the energy wasted to generate electricity. The power generation using footsteps get its energy requirements from the Non-renewable source of energy. There is no need of power from the mains and there is less pollution in this source of energy. It is very useful in the places like railway stations, shopping complex etc.

It is able to extend this project by using same arrangement and construct in the foot steps/speed breaker so that increase in the power production rate by fixing it in school, colleges, highways etc The output power generated is 3V.Our final conclusion in this project is creative way to make use of the energy wasted in various ways.

By storing output power in batteries we can utilize this for further use. By making to rotate rack and pinion arrangement in either direction the output power can be increased. When we implement this project in large scale the overall cost of the project reduces.

6. ADVANTAGES

- Highly efficient in more crowded places.
- Depending upon the power generator and number of them, power output is very high
- This process depends on human resources which is available in plenty in our country which makes our country a favorable place for this project.
- Promising technology for solving power crisis to an affordable extent.
- Low cost level.

- Simple in construction.
- Pollution free.
- Reduces transmission losses.

7.APPLICATIONS

- Railway, subway stations
- Roads
- Temples
- Bus stands, air ports
- Music halls, auditoriums
- Markets

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