
**STAIRCASE POWER GENERATION- A NEW TECHNOLOGY FOR
SUSTAINABLE RURAL DEVELOPMENT**

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ABSTRACT

As the demand of energy is growing day by day, so the ultimate solution is to find out alternate way for producing the renewable sources of energy. Humans are using the renewable energy which are solar, wind etc. but we still could not satisfy our power needs, because of that we have to generate electricity through each and every possible ways. The objective of this work is power generation through footsteps as a source of renewable energy that we can obtained while walking on to the certain arrangements like footpaths, stairs, plate forms and these systems can be install elsewhere specially in the dense populated areas. In this work we are generating electrical power as non-conventional method by simply running on the train in the foot step. Non-conventional energy system is very essential at this time to our nation. Non-conventional energy using stair case needs no fuel input power to generate the output of the electrical power. This project uses simple drive mechanism such as rack and pinion assembly. The control mechanism carries the rack & pinion, D.C generator, battery and inverter control.

Keyword: - Footstep, renewable energy, Mechanism, D.C. Generator, Rack & Pinion, Chain

1. INTRODUCTION

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. Proposal for the utilization of waste energy of foot power with human locomotion is very much relevant and important. 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 or Sanyo coil and current produced is stored in dry battery. To reduce the external compression, a responsive sub-flooring 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. 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. The weight which acts on the staircase is used to generate electrical energy. The Mechanical energy (weight) is converted into electrical energy using drive mechanism such as rack and pinion assemblies. When appears on claims the staircase, a force has been acted on the step. This has been placing data certain angle of inclination. Due to the force the steps moves downward and other act will moves down and so the

pinion gear which has been connected to the rack will tends to rotate. This rotational speed has been increased using Chain and sprocket drive.

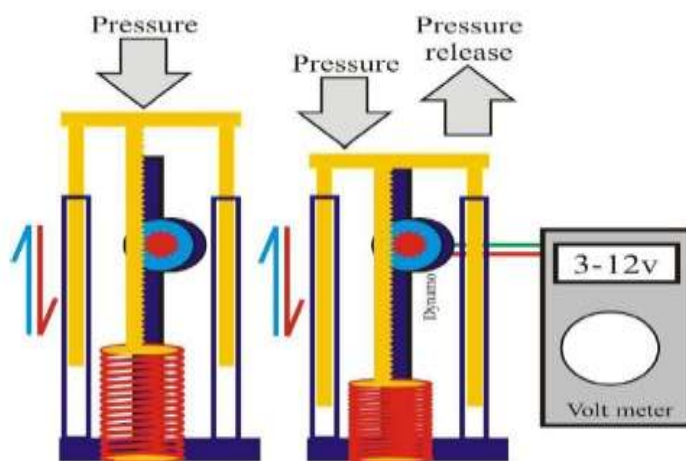


Fig. No. 1.1: Dynamo, rack and pinion gear working mechanism

1.1. Problem Statement

- Design and Develop the model of Stair case power generation
- Also to fabricate the model of the same which would able to show the characteristics of the systems and working according to need

1.2. Objective

- To provide the electricity in rural areas.
- To promote the non-conventional energy source
- To store the electricity for further use
- To produce electricity at cheapest cost
- To produce electricity when rack move in upward direction

1.3. Scope

The utilization of energy is an indication of the growth of a nation. For example, the per capita energy consumption in USA is 9000 KWh (Kilo Watt hour) per year, whereas the consumption in India is 1200 KWh (Kilo Watt hour). We can say that to be materially rich and prosperous, a human being needs to consume more and more energy. A recent survey on the energy consumption in India had published a pathetic report that 85,000 villages in India do not still have electricity. Supply of power in most part of the country is poor. Hence more research and development and commercialization of technologies are needed in this field .In India, unlike the developed countries we do not have elevators or lifts in the buildings of rural area. There are still conventional steps are used for steps on the floor. From our point, the energy can be utilized by just placing a unit “Staircase Power Generation system”. By placing this system in a rural building or in places like railway stations, so much of energy can be tapped. This consumed energy can be used for the lights on the rural area or the crowded places like railway stations, colleges etc

2. LITERATURE SURVEY

2.1. Power Generation from Foot (Steps)

Power can be generated through we are stepping on the stairs; the generated power will bestrode and can be used for domestic purposes. This system can be installed at homes, colleges, railway stations, where the people move around the clock. The utilization of waste energy of human foot power populated countries like India and China. A special mechanical arrangement such as crankshaft mechanism is employed on the stair case. This arrangement will convert the foot power applied on stairs, as a rotary motion. This rotary motion will be used to generate efficient electricity. It's an eco-friendly; easily accessible and non-conventional power generation system when compared to existing systems.

2.2. Foot Step Power Generation System (Weight)

In this research the generation of electrical energy is described by using the weight energy. Person can amaze simply knowing that how much energy a person has by simply walking on the floor with normal speed. So the people usually have thousands steps in a day. While people walk they lose huge amount of energy that their weight energy of foot may be used and converted into electrical energy. The basic principle of 'Foot sep power generation' is based on piezoelectric sensor in order to employ this system adjust the wooden plates above and below the piezoelectric sensor and moving springs when person will walk on that mat the force will be applied in the result magnet will be fixed under the top wooden sheet and moves into the cavity. Finally, conclusion is such type of design and techniques of Generating power are very useful to compare the supply and demand of energy globally.

2.3. Foot Step Power Generation Using Piezoelectric Material

Piezoelectric effect is the effect in which mechanical vibrations. Pressure or strain applied to piezoelectric material is converted into electrical form. This research gives idea about how energy is used on stepping on stairs. The use of stairs in every building is increasing day by day even small building has some floors when we are stepping amount of this wasted energy is utilized and converted to electricity by Piezoelectric effect. Piezoelectric effect is the effect of specific materials to generate an electric charge in response to applied mechanical stress. In this electric power is generated as non-conventional method. Thus the generation of power is by walking or running on foot step. At this time non-conventional energy is very important. This system introduces power generation using non-conventional energy which does not need any input to generate electrical output. In this conversion of force energy into electrical energy takes place.

3. WORKING

3.1. Working Principle

The complete diagram of the power generation using STAIR CASE is given below. L-shapes window 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 STAIR CASE which is mounded bellow the L-shapes angle frame. The spring is used to return the inclined L-shapes angle frame in same position by releasing the load. The gear wheel is coupled to the smaller motor shaft. The generator is used here, is permanent magnet D.C generator. The generated voltage is 12Volt D.C. This D.C voltage is stored to the Lead-acid 12 Volt battery. The battery is connected to the inverter. This inverter is used to convert the 12 Volt D.C to the 230 Volt A.C. This 230 Volt A.C voltage is used to activate the light, fan and etc. By increasing the capacity of battery and inverter circuit, the power rating is increased. This arrangement is fitted in FOOT STEPS; the complete arrangement is kept inside the floor level except the pushing arrangement.

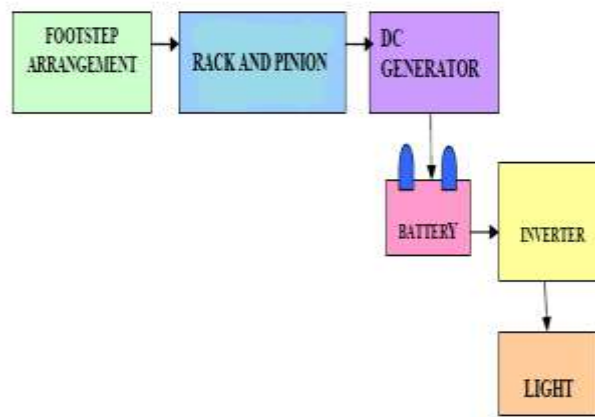


Fig -2: Block diagram

3.1.1. Stair cases arrangement

This is made up of mild steel. The complete set up is fixed in this model FOOT STEP. The two L-shapes frame is fixed in the above two ends of the track. Below this l-shapes window, the actual power generation arrangement is constructed. This L-shapes window pushes the rack when the time of train wheel moving on these arrangement.

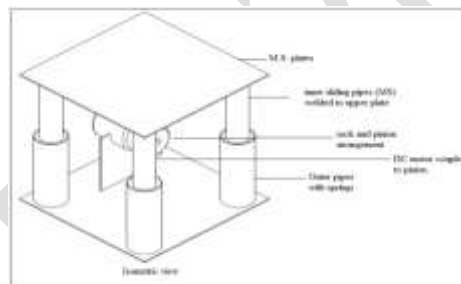


Fig -1: Schematic diagram for single step

3.2. Working operation

when no load is applied

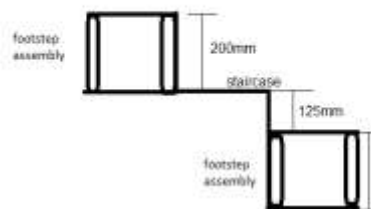


Fig -1: Staircase without load

when load is applied

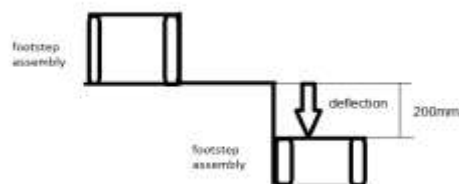


Fig -1: Staircase with load

3.2.1. Operation description

In this system power is generated by using footstep mechanism where rack and pinion mechanism is used. The prototype model of the staircase power generation contains MS 1 angle frame in which footstep model is assembled. The footstep model contains upper plate, lower plate, rack and pinion mechanism, gear ratio to improve the power generation, DC motor, spring. When load is acted on the upper plate of system it moves in downward direction. Rack is assembled to the upper plate of the footstep it moves in downward direction which results in rotation of gear. Because of the gear ratio used in the footstep it increases the power the power generation of the system. DC 12volt battery is used to generate the power generation.

Assembly Diagram:

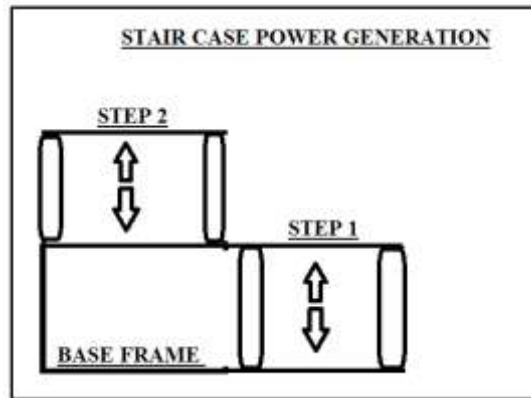


Fig -1: Assembly of Staircase

3.2.2. Component of project

Consists of the following main parts:

1. MS plate
2. MS Pipes
3. Rack and pinion
4. DC motor
5. STAIR FRAME
6. LED lights Etc.

4. CONCLUSIONS

Since the power generation using stair case get its energy requirements from the Non-renewable source of energy. The waste energy supplied by human is utilized in this system. This energy source is continuous and renewable. There is no need of power from the mains and there is less pollution in this source of energy. It is very useful to the places all roads and as well as all kind of stair case which is used to generate the non-conventional energy like electricity. It is able to extend this project by using same arrangement and construct in the footsteps so that increase the power production rate by fixing school and colleges, highways etc..By increasing size and specifications of motor and assembly we can increase the output of system if required in future.

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