Footstep Power Generation

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Abstract

There are two types of energies i.e. conventional energy and non-conventional energy conventional energies are the source of energy i.e. fuel coal, mineral, etc is now depleting day by day .These sources are getting exhausted and are responsible for energy crisis. Use of non-conventional energy is one of the effective and alternative method for this problem. The human locomotion is being wasted so we can utilize this wasted energy for the energy demand. In this project we are presenting a idea of generating electric energy by using simple human locomotion or footstep i.e non-conventional energy source. In this project we can convert mechanical energy into electrical energy by using mechanical and electrical setup. This arrangement is placed under a floor which contains rack, pinion, spring, gear mechanism and electrical equipment like battery, inverter, generator and load. When a person walk over such system the human locomotion i.e. kinetic energy is converted electric get stored which can be provided to nearby places. This project can prove beneficiary for health aspect and pollution aspect. By using this concept on a large scale, large power can be tapped out.

Keywords: *Energy demand, Footsteps, Electric generation, Non-conventional energy, Energy conversions.*

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INTRODUCTION

Every species on the earth needs energy for its survival. Energy plays an important role. It can be of various forms. Since man came on the earth a few million years ago he is consuming energy for his sustenance and well being, As the population is increasing energy rate increasing. So man started using conventional energy like coal, petrol, natural gas etc, but they are depleting at a great extend. For an alternative method non-conventional energy source is best way. There are number of method to generate power but footstep can be made effective resource.

Human Locomotion is being wasted so utilization of this wasted energy can be used for the production of the power. This process involve number of simple setup that are install under walking platform. This whole human energy being wasted can be made power generation more at crowded countries. In populated countries places like road, railway station, colleges etc. where all are overcrowded as a result large amount of power can be obtained.

COMPONENT DESCRIPTION

3.1. Rack And Pinion:

Rack and pinion gears shown in fig3.1 are used to convert rotation (from pinion) into the linear motion (of the rack). A rack and pinion is a type of linear actuator that comprises a pair of gears which convert rotational motion into linear motion. The circular pinion engages teeth on a linear "gear" 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.

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Fig3.1. rack and pinion

3.2. Dc Generator:

In electricity generation, an electric generator is a device that converts mechanical energy to electrical energy. The reverse conversion of electrical energy into mechanical energy is done by a motor, motor and generator have same similarities. The gear wheel is coupled to the generator shaft with the help of another gear wheel. The generator is used here, permanent magnet DC generator shown in fig3.2. The generated voltage is 12volt DC.

3.3. Gears:

Gears are the mechanical parts with cut teeth design to mesh with teeth on another part so as to transmit or receive force or motion. Gears are also sometimes called toothed wheels or cogged wheels or cogs. The cut teeth are also sometimes called cogs.

Fig3.2. dc generator

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Fig 3.3 Gears

Gears are positive type drives which are used to transmit motion between two shaft or a shaft and a component having linear motion, by the meshing of two or more gears. gher operating cost. Gears of differing size are often used in pairs for a mechanical advantage allowing the torque of driving gears to produce a larger torque of the driven gears at lower speed, or smaller torque at higher speed. The larger gear is known as wheel and smaller as a pinion. This is the principle of the automobile transmission, allowing selection between various. There is actually some loss of output power due to friction. The gears wheel section is attached with generator through coupling. The fig 3.3 shows Gears Wheels.

3.4. Shaft:

It is a rotating element, which is used to transmit power from one place to another place. It supports the rotating elements like gears and fly wheels. It must have high torsional rigidity and lateral rigidity. The shaft is as shown in fig3.3.

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Fig3.4. shaft

3.5. Spring:

A spring which is shown in fig3.5 is defined as an elastic body, whose function is to distort when loaded and to recover its original shape when the load is removed. The various important applications of spring are as follows:

- To cushion, absorb or control energy due to either shock or vibration as in car spring, railway buffers, air-craft landing gears, shock absorbers and vibration dampers.
- To apply forces, as in brakes and clutches and spring loaded valves.
- To control motion by maintaining contact between two elements as in cams and followers.
- To measures forces, as in spring balances and engine indicators.

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Fig3.5. spring

3.6. Rechargeable Battery:

A rechargeable battery which is shown in fig 3.6 is a group of one or more electromechanical cell. They are known as secondary cell because their electromechanical reactions are electrically reversible. Rechargeable batteries come in many different shapes and sizes, ranging anything from a button cell to new rechargeable batteries have to be charged before use; newer low self discharge batteries hold their charge for many month and supplied charged to about 70% of their rated capacity.

Grid energy storage application use rechargeable batteries for load leveling, where they store electric energy for use during peak load period, and for renewable uses such as storing power generated from photovoltaic arrays during the day to be used at night. By charging batteries during period of high electric demand, load leveling help eliminate the need for expensive peaking power plant and help amortize the cost of generator over more hour of operation.

The US National Electrical manufacturers Association has estimated the US demand

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for rechargeable batteries is growing twice as fast as demand for non- rechargeable.

Fig3.6. Rechargeable battery

3.7. LED:

The longer lead is the anode (+) and the shorter lead is the cathode(-). The schematic symbol is as shown below .In the symbol the anode is on the left and cathode is on the right. Light emitting diode are elements for light signalization in electronics.

They are manufactured in different shapes, color and sizes. For their low price low consumption and simple use, they have almost completely pushed aside other light sources-bulbs at first place.

It is important to know that each diode will be immediately destroyed unless its current is limited. This means that a conductor must connected in parallel to a diode. In order to correctly determine value of the this conductor, it is necessary to know diode's voltage drop in forward direction, which depend on what material a diode is made of and what color it is.

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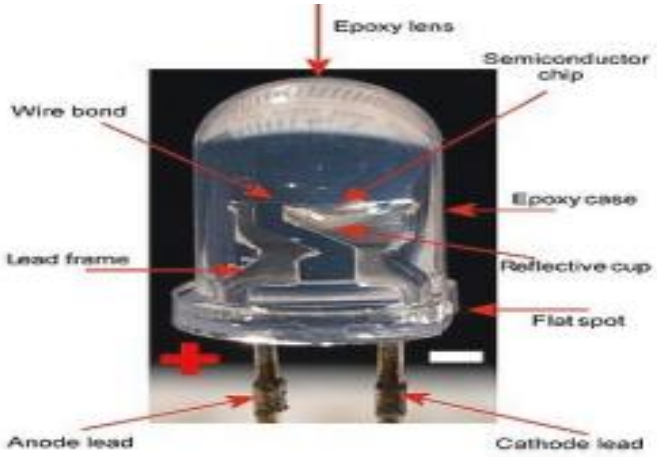

Fig3.7. Light emitting diode

WORKING

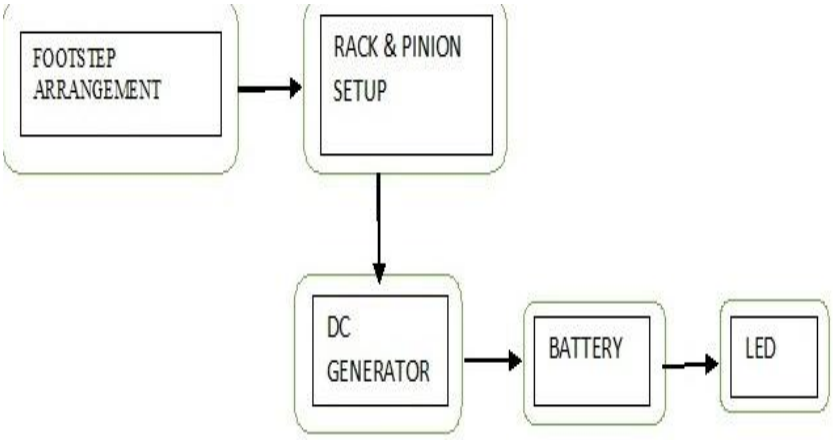

Fig 4.1 Block Diagram

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The system is as shown in the above fig4.1. This system consists of rack and pinion arrangement, two springs, gears, dc generator, wires, 12 v lead acid battery, LED etc. A responsive flooring system made up of blocks that depress slightly under the force of human steps would be installed. The flooring system depresses to a little extent as people walk over them which in turn depresses the mechanical setup installed immediately beneath it. This simple mechanical setup consists of a compressible top platform and a immovable bottom platform.

When a person walks on the base (plywood) his weight causes an impact on it. This load is distributed uniformly over the plywood. This load causes the springs to compress. The rack which is attached to the base moves linearly downward and rotates the two pinions meshing with it. It is obvious that the pinions will rotate in opposite direction. When the rack moves linearly downward during the impact of load on the platform, it causes both the pinion to rotate. But the direction of motion is opposite, that is one of the pinions rotates clockwise while the other anti-clockwise. This rotating rack causes intermediate gear coupled to it to rotate and thereby transfer the motion to the output gear. The motion available at the output gear is utilized to run the dynamo to generate electricity. 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. This inverter is used to convert the 12 Volt D.C to the 230 Volt A.C. This working principle is already explained the above chapter. 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.

Advantages

i. The footstep power generation is very reliable. We only use racks and pinion arrangement and hence it is economical and ecofriendly.

ii. The mechanical arrangement is noise free and hence no such problem of noise pollution is involved in here.

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iii. As mentioned already when the wooden plank is pressed power is generated and hence it's

iv. The rack pinion arrangement is very easy to construct thus easy construction. It also gives us wide dynamic range. And electricity can be used for many purposes.

v. No fuel storage is required.

vi. Maximum utilization of energy.

vii. No manual work necessary during generation.

viii. Simple Construction, mature technology and easy maintenance.

ix. Uninterrupted power generation during day and night.

x. Power also generated by running or exercising on floor.

Disadvantages:

i. The footstep power generation is only applicable for the particular place, where there is a lot of traffic.

ii. Tiles used are durable but not everlasting. Hence the cost of tiles may be burden sometimes.

iii. Care should be taken for batteries.

iv. We have to check mechanism from time to time, it can get rusted in rainy season.

v. Initial cost of this arrangement is high

CONCLUSION

In this system we have generated the electric power as non-conventional method by simply walking or running on the foot step. We have completed this project. This can be one of the good economical, affordable energy solution to common people. This can be used for many applications. As India is a developing country where energy management is a big challenge for human population by using this project we can drive both A.C as well as D.C loads according to the requirement. Power generated is directly proportional to the force applied on the dynamometer and the number of rotations of shaft of the D.C. Motor.

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As a fact only 11% of renewable energy contributes to our primary energy. If this project is deployed then not only we can overcome the energy crises problem but this also contributes to create a healthy global environmental change.

Applications

- In bus station
- In railway station
- In car parking system
- In Airports
- In Lift system
- In car lifting system
- In street lights
- Electric escalators
- In Disco, cinema theatres

FUTURE SCOPE

- This system can be used in speed breakers at highways.
- This system can also be used in very busy stairs.
- As people are conscious about their health so this system can be used in parks also.

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