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Railway Track Power Generation

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Abstract
Electricity is the most widely used form of energy. Electricity is lifeblood of our modern society. Demand for power is positively and highly correlated with the population and economic growth. We can leave without all those modern objects but our body still needs electricity. In this project we have attempted the methodology of electrical power generation by simply running train on the railway track by using a simple method of non-conventional energy source method. Today's there is high need of non-conventional energy source to our nation. The energy gathered by the simple method of railway track is one of the provenances to provide the non-conventional energy. As the technology is propelling the swallowing of power is firmly climbing. The cost of provision and the dispute of power generation plays valuable role in the country's appropriateness in the world economy. It should be known that major non-conventional energy sources found in our country. Non-conventional energy is abundant, renewable, pollution free and eco-friendly sources. It can be more conveniently supplied to rural, urban and even remote areas. Thus, it is adaptable of clarifying the twin problems of energy supply in the decentralized manner and helping in sustaining cleaner environment. It is the energy of the future. No wonder, non-conventional energy is fast catching the imagination of the people in India. For this reason, we are using non-conventional energy resources and even energy can be gained from the wasted materials. The energy harvested from the railway track is one of the renewable energy sources because there is no need of fuel as the input to generate the output power as the electrical power. These are done by using mechanism of simple gear drive mechanism. The mechanism carries the flap, rack and pinion, gears, fly wheel, free wheel, DC generator, battery. This proposed arrangement can result in high production of electricity and this power is utilized for the track side infrastructures.

Keywords: *Rack and pinion; power harvesting; railway track; non-conventional method; energy*

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I. INTRODUCTION

Electricity is one of the most widely used forms of energy. Today also there is great scarcity of electricity. In this study an innovative concept of Generating Electricity from moving vehicles is presented i.e., Railway Track Power Generator by Using Flip Plate Mechanism. Producing electricity from a Railway Track Power Generator is a new concept that is undergoing research. The number of vehicles on Railway Track is increasing rapidly and if we convert some of the kinetic energy of these vehicle into the rotational motion of generator then we can produce considerable amount of electricity, this is the main concept of this project. Today our whole life style is dependent on electricity. With the increasing population the use of electric power is also increasing. But we know that the resources to generate electricity are limited, and this has led to the energy crisis. During this scenario we need to generate electricity from the things used in day-to-day life. In this project the speed breakers present on Railway Track s are used to generate electricity. As we know that vehicles on Railway Track are increasing day by day which will help us to generate electricity as these vehicles pass through the speed breakers? This electricity generated can be used for different purpose such as lighting of signals and streetlights on Railway Track etc.The principle of the electric power generation using sliding mechanism is very simple. It is based on the same principle as in the case of electricity generation in case of hydroelectric power plant, thermal electric power plant, nuclear power plant, geothermal energy, wind energy, tidal energy etc. In all of the above power plant mechanical energy is converted into electrical energy. In this setup also mechanical energy is converted into electrical power using a D.C. generator. Here the vertical motion of the top of the sliding plate is converted into the rotational motion, which in turn rotates the generator and generates electricity.

1.1NAME OF THE COMPONENTS

Components used in Electrical Power Generation by Using Railway track as follows;

1. Railway track arrangement.
2. Flap.
3. Free wheel.
4. Spring.
5. Fly wheel.
6. Rack and Pinion mechanism.
7. AC Generator.
8. Shaft.

1.2 HARDWARE DESCRIPTION

I. RAILWAY TRACK ARRANGEMENT: -

A railroad or railway is a track where the vehicle drives over the two parallel steel bars called rails. The rails Support and guides the wheel of the vehicles which are commonly either trains or trams.

II. FREE WHEEL: -

A free wheel or overrunning clutch is a device in transmission that disengages the drive shaft from the driven shaft when the driven shaft rotates faster than the drive shaft. An overdrive is sometimes mistakenly called a free wheel, but is otherwise unrelated.

III. SPRING: -

A spring is an elastic object that stores mechanical energy. Springs are typically made of spring steel. There are many spring designs. In everyday use, the term often refers to coil springs. In these projects we are using helical spring.

IV. FLY WHEEL: -

A Fly wheel is a mechanical device specifically designed to efficiently store rotational energy. Fly wheel resist changes rotational speed by their moment of inertia. The amount of energy stored in a fly wheel is proportional to the square of its rotational speed. The way to change a flywheel's stored energy is by increasing or decreasing its rotational speed by applying a torque aligned with its axis of symmetry.

V. RACK AND PINION MECHANISM: -

A rack and pinion are a type of linear actuator that comprises a pair of gears which convert rotational motion into linear motion. In a rack railway, the rotation of a pinion mounted on a locomotive or railcar engages a rack between the rails and forces a train up a steep slope. Rack and pinion are made from different materials as cast iron, cast steel, alloy steel etc. They are used repeatedly in long travel appliance that requires high stiffness and accuracy.

VI. AC GENERATOR: -

An electric generator is a machine which converts mechanical energy into electrical energy. It is based on the principle of production of dynamically induced e.m.f whenever a conductor cuts magnetic flux, dynamically induced e.m.f is produced in it according to Faradays Laws of Electromagnetic Induction. This e.m.f causes a current to flow if the conductor circuit is closed.

1.3 PROJECT DESIGN

Design is an innovative and highly iterative process. It is also decision-making process. Decisions sometimes haveto be made with too little information, occasionally with just right amount of information, or with an excess of partially contradictory information. Decisions are sometimes made tentatively, with the right reserved to adjust as more become known. This project design is associated with the production and processing of energy and with providing the means of production. Figure. 1 shows the Modelling of mechanism by using Solid Edge software.

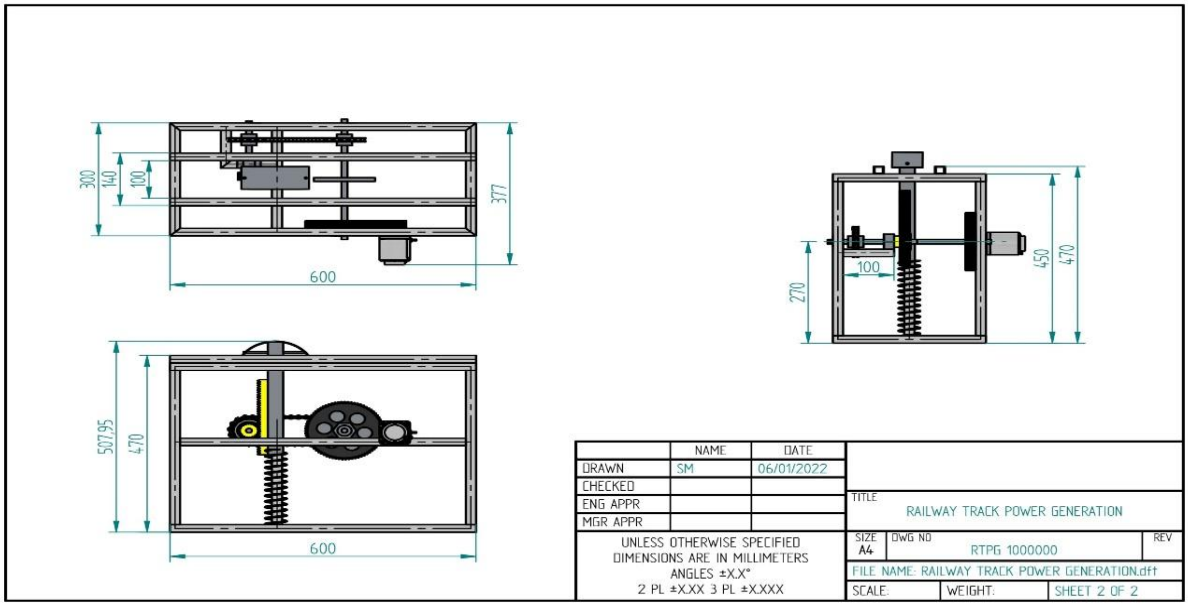

Figure 1: - Detailed Model Assembly.

1.4 PRINCIPLE

The principle used in this project is Conversion of energy. Conversion of energy states that transformation of one form energy into another, usually to convert the energy into a more useful form. First law of thermodynamics: Energy can neither be created nor destroyed. Form of energy: Form of energy includes hest, light, electrical, mechanical, nuclear, sound and chemical.

II. WORKING OPERATION

Railway Track Power Generation (RPG) is a system design to capture waste and kinetic energy from all vehicles. This device converts the kinetic energy of the vehicles into electric energy. This is done by moving plate installed on the Railway Track, this plate captured very small movement from the Railway Track surfaces and it transferred to a key way flywheel system. From hundreds of wheels lies a single flywheel having used to driving machinery. The RPG included the method of driving one flywheel to another, once it reached predetermining velocity. The RPG flywheel system has been developed to achieve large amount of moment of inertia in relatively small space. The captured energy is converted into electricity which is fed into power grid. In this project the two sliding plates are mounted on the Railway Track surface and these plates are followed by the sliding mechanism arrangement. Sliding plates are mounted on the shaft which is attached to the frame via bearing. Spring arrangement is made for flexible sliding motion of sliding plates when vehicles are moving on the Railway Track. Frame is installed under the Railway Track. And the shaft rod is connected to sprocket. This sprocket wills converts sliding motion into rotary motion. This sprocket arrangement is connected to the gear arrangement. Gear is mounted on the A.C generator. As wheel of the vehicle reaches upper most position of the plate, plates get slide through guide; Simultaneously shaft moves sliding provide torque to sprocket. The sprocket transmitted this torque to shaft. Shaft is supported by two bearings attached on wall of frame. The shaft having gears and flywheel arrangement on shaft through one way bearing. This arrangement functions to enhance rotation of flywheel for small motion of shaft. The bigger gear has coupled with smaller gear mounted on the A.C. generator shaft. The A.C. Generator converts the rotation of smaller gear into electricity.

As the train passes over the railway track the load acted upon the flap over the track or plant setup is there by transmitted to rack pinion and chain sprocket arrangements, where the reciprocating motion of the track is converted into rotary motion with the help of rack & pinion arrangement.Then this rotary motion is then fed on to the gear drives which supply this motion to the other shaft were chain sprocket and flywheel mounted.The flywheel multiplies its speed, this speed which is sufficient to rotate the rotor of generator is fed into the generator were electro motive force is produced that generates electricity.

This electrical power can be stored to battery. The generated power can be used for the lamps on the railway station and LCD display or connected to grid and this will be a great boon for the rural villages too.

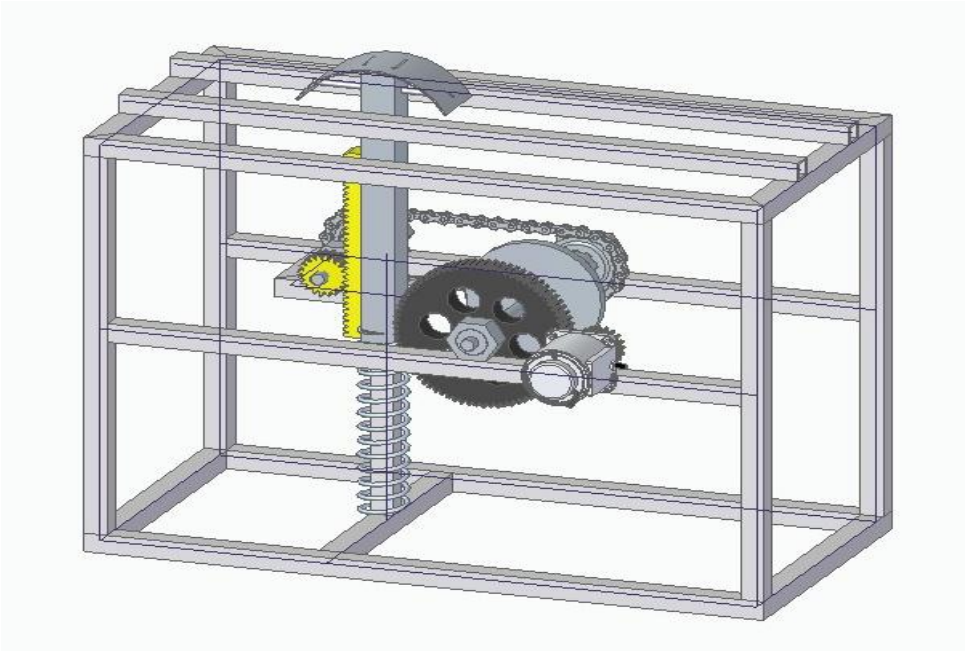

Figure 2: - Main Assembly.

2.1 Experimentation and Evaluation: -

In the model certain assumptions are made the sake of model testing.They are as follows:

1. The train weight is assumed to be the standard weights that are used to test the performance.

2. The load on the flap is assumed to be vertical and no horizontal components are presents.

3. The loads are all sudden loads.

III. CONCLUSION

In this project electrical power was generated at railway track by using rack and pinion mechanism. This type of power generation is identified to be cheaper than many other alternatives and the model has a smaller number of parts and assembly would cost very less with all the components bring available regularly and no model specific parts are to be manufactured.It is that the electrical power is in great demand, we as mechanical engineer should be in discovered for new idea of power generation. As energy can never be created or destroyed, we should transform it into the form that we can used to supply for railway station equipment light, fan, signal light etc. We can implement this system at both entry and leaving point in the railway station. This arrangement can be used in different application like in foot step or speed breaker at school, colleges and highway of generation of electrical energy. So that is the power production rate is increased and demand at particular area can be fulfilled.

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