Rack and Pinion Method for Electricity Generation

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***Abstract*- We illustrates generation of electricity through speed breakers. Here we used a technique of harvesting energy by three mechanisms- Rack and pinion mechanism .This technique is beneficial to those areas where generation of electricity is a difficult task. When a vehicle moves over the speed breakers its kinetic energy which is due its speed, friction between road and its wheels .The world is growing at a rapid pace. Among many vital sectors of our social life, transportation sector has a key role to play. It is an ever growing sector with the escalating population, growing needs and creeping number of vehicle users. The traffic on the roads becomes doubled or tripled, at alarming rates. If vehicular motion can be put to generate useful power, it can be put to effective use. This idea has mothered the invention of "power generation through speed breakers", inspired by various other existing designs .To generate power using speed breakers through rack and pinion mechanism by tapping the energy and utilizing it for various purposes such as lightening the street lights, etc. This electrical energy is in the form of DC and we used inverter which converts DC into AC. Large amount of electricity can be generated saving lot of money and if implemented will be very beneficial for Government.**

***Index terms*- Speed breaker, Rack and pinion mechanism, kinetic energy, power generation.**

I.INTRODUCTION

Man in his lifetime uses energy in one form or another. There is great possibility of tapping this energy and generating power by making the speed-breaker as a power generation unit. The generated power can be used for the lamps, near the speed breaker.

II.WORKING

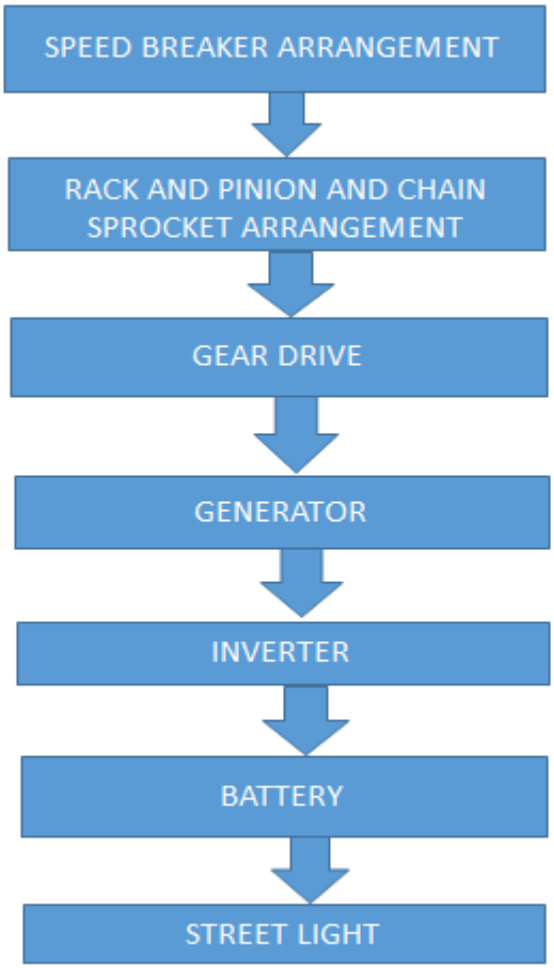
This project explains the mechanism of electricity generation by rack and pinion method [1][2].When any vehicle travels on the road it goes upon the speed breaker system and is transmitted to rack and pinion mechanism. When the vehicle runs over the speed breaker, the vehicle usually lifts up by the maximum height of the speed breaker. If the speed breaker is free to move, the bump would be displaced vertically down, instead of vehicle moving up. The moving bump pushes the rack downwards. The rack, meshed with the sprocket switches the linear motion to rotary motion. This motion is transferred to the shaft of the sprocket. The sprocket that sits on the same shaft also rotates with the same shaft. This sprocket is in mesh with the sprocket through the chain. The chain drive rotates the second shaft. The gear on this second shaft rotates along with the shaft. This gear is in mesh with the gear. This gear sits on the generator shaft. Thus the generator shaft is driven by the whole mechanism with the motion of the bump. The speed is then achieved due to rotary motion at the larger sprocket wheel is less, as the power is transmitted to gears, the final speed achieved is high. This speed is sufficient to rotate the rotor of a generator and is fed into the rotor of generator. [4] The rotor which rotates within a static magnetic stator cuts the magnetic flux surrounding it, thus producing the electric motive force (emf). This generated emf is then sent to an inverter, where the generated emf is regulated . This regulated emf is now sent to the storage battery where it is stored during the day and it used to power the street lights at the night time.

III.LITERATURE REVIEW

The population rise and the constant increase in energy demand gives rise to the energy crisis. The studies to solve this energy crisis led to the idea of generating power using rack and pinion mechanism. The idea of basic physics to convert the linear motion of vehicles into kinetic energy and further convert into electrical energy that otherwise goes waste. The idea caught our team and we decided to develop such a project that will produce more power and store it

for the use at night time in our effort to use energy efficiently.

IV.BLOCK DIAGRAM



V.EQUIPMENT REQUIRED

5.1. Rack and Pinion

A rack and pinion is a type of linear actuator that comprises a circular gear (the pinion) engaging a linear gear (the rack), which operate to translate rotational motion into linear motion. Driving the pinion into rotation causes the rack to be driven linearly. Driving the rack linearly will cause the pinion to be driven into a rotation. 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 forces a train up a steep slope.

5.2. Chain Sprocket

A chain and sprocket drive is a type of power transmission in which a roller chain engages with two or more toothed wheels or sprockets, used in engines as a drive to transfer motion from one shaft to another.

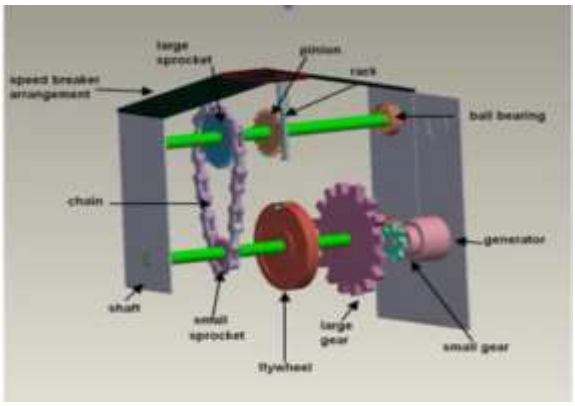
5.3. Flywheel with Bearing

A flywheel is a mechanical device specifically designed to efficiently store rotational energy (kinetic energy). Flywheels resist changes in rotational speed by their moment of inertia. The amount of energy stored in a flywheel is proportional to the square of its rotational speed and its mass. The way to change a flywheel's stored energy without changing its mass is by increasing or decreasing its rotational speed.

5.4. DC Generator

It is a device which converts mechanical energy into electrical energy. The generator uses rotating coil of wire and magnetic fields to convert mechanical rotation into pulsing direct electric current through Faraday's law of electromagnetic induction.

VI. CONSTRUCTIONAL DETAILS



VII. RATINGS

- Rack- 40 teeth
- Pinion- 14 teeth
- Shaft- 25mm
- Small Sprocket- 40 teeth
- Flywheel diameter- 8 inch
- Flywheel weight- 5kg
- Generator- 4-5 Volt Output
- Simplex Chain
- Battery- 12V, 7.3A (approx..)

- Convertor Circuit DC to AC
- LED
- Multimeter

VIII. CONCLUSION

This type of electricity generation helps us in saving our conventional resources as it generates electricity through renewable natural resources which are easily available. By this method electricity can be generated without depending on other factors and can meet high demands of future. It is also environment friendly process. There is also nowhere obstruction in traffic flows. It is automatic and no need of man power resource in this. This has application in many areas such as street lights and traffic lights which stop accidents from happening. "Electricity plays a very important role in our life". As the population of India is increasing day by day, the electricity generation has become a major issue and it does not fulfill the requirements of people described here about a technology to generate electricity from speed breakers which is reliable and will help in conserving our natural resources.

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