

ROAD POWER GENERATION (RPG) BY FLIP PLATE MECHANISM

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ABSTRACT

This paper presents the overall concept of Road Power Generator (RPG) that deals with the mechanism to generate electricity from the wasted kinetic energy of vehicles. It contains a flip-plate, gear mechanism, flywheel, and finally a generator is coupled at the end so that the rotational motion of the flywheel is used to rotate the shaft of the generator, thus producing electricity. RPG does not require any piezoelectric material. It is novel concept based on flip-plate mechanism. The paper can be installed at highways where a huge number of vehicles pass daily, thus resulting in more amount of electricity generated. This generated electricity can be utilized for different types of applications and mainly for street lighting, on road battery charging units and many domestic applications like air conditioning, lighting, heating, etc.

Keywords: Rack And Pinion, Flip Plate, Wasted Energy, Flywheel

INTRODUCTION

Electricity is one of the most widely used forms of energy. Today also there is great scarcity of electricity. There is 15,000 to 20,000 vehicles travel along each main road every day. In this study an innovative concept of Generating Electricity from moving vehicles is presented i.e. Road Power Generator by Using Flip Plate Mechanism. Producing electricity from a Road power generator is a new concept that is undergoing research. The number of vehicles on road 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.

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 lead to the energy crisis. During this scenario we need to generate electricity from the things used in day-to-day life. This electricity generated can be used for different purpose such as lighting of signals and streetlights etc.

1.1.System overview

The principle of the electric power generation using Flip plate 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 Flip Plate is converted into the rotational motion, which in turn rotates the generator and generates electricity.

II.BLOCK DIAGRAM

The flip plate is coupled to the belt and flywheel system, which in turn provides mechanical input to the DC generator. This energy is stored in batteries and can be used for lighting purpose, etc.

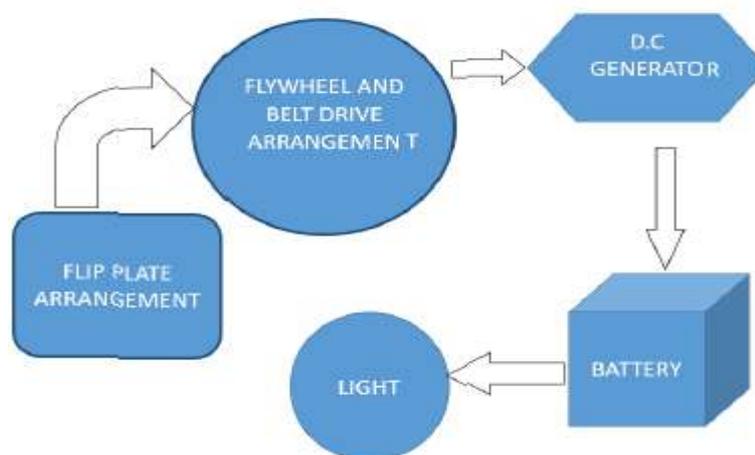


Fig: Block diagram of RPG system

2.1.Flip plate

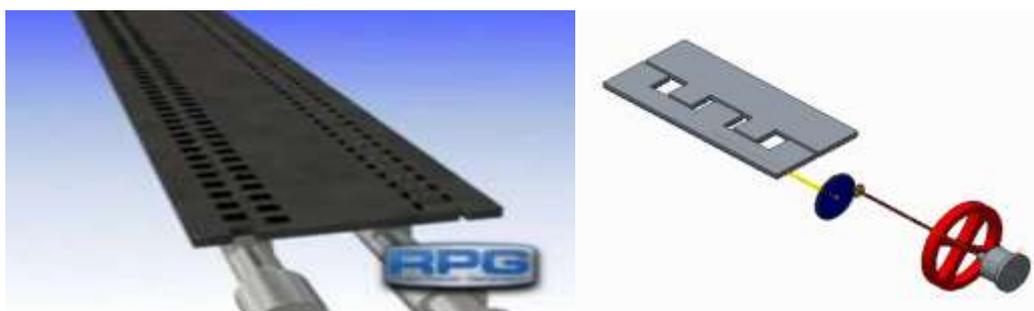


Fig: Arrangement of flip plate

- i. We have selected material (Nylon Plastic) because it has light weight and have high strength.
- ii. In the design of flip plate a gap is provided for smooth operation

2.2. Working principle

Road 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 road, this plate captured very small movement from the road surfaces and it transferred to a key way flywheel system. From hundreds of wheel 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.

2.3. Working Mechanism

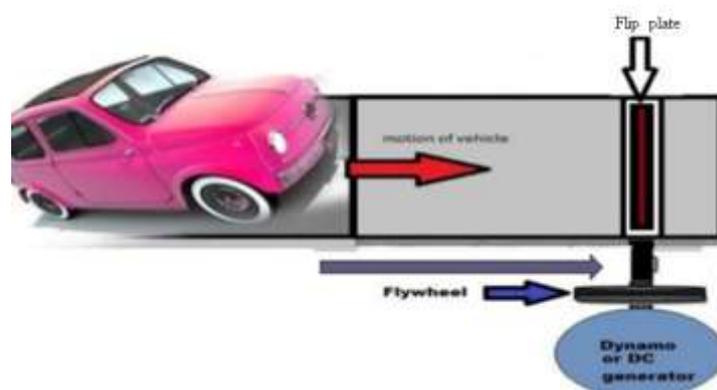


Fig: Whole Mechanism of RPG

In this paper the two flip plates are mounted on the road surface and these plates are followed by the rack and pinion arrangement. Pinion is mounted on the shaft which is attached to the frame via bearing. Frame is installed under the road. The flywheel with pulley is mounted on the shaft and second pulley is mounted on the D.C generator and these two pulleys are connected with the help of v belt. As wheel of the vehicle reaches upper most position of the plate, plates get slide through guide, simultaneously rack moves downward provide torque to pinion. The pinion transmitted this torque to shaft. Shaft is supported by two bearings attached on wall of frame. The shaft having pulley and flywheel arrangement on shaft through one way bearing. This arrangement functions to enhance rotation of flywheel for small motion of shaft. The bigger pulley has 2 belts coupled with smaller pulley mounted on the D.C. generator shaft. The d. c. Generator converts the rotation of smaller pulley into electricity.

III.CALCULATIONS

Assuming the weight of the two wheeler=270Kg. Assuming the location as toll booth Assume Average speed of the vehicle = 20km/hr Maximum height of the plate = 10cm We know that, For mechanical system the power is the combination of force and movement. Therefore power is the product of a force on an object and its velocity.

Output Power calculations

Let us consider, The mass of a vehicle moving over the flip plate = 270 Kg.

Height of the plate from surface = 10 cm.

Work done = Force x Distance

But, Force = mass x acceleration due to gravity = $270 \times 10 = 2700\text{N}$.

Therefore, Work done/sec = $(2700 \times 0.10/60) = 4.5\text{watt}$

(for one pushing force).

Power developed for 1 vehicle passing over the flip plate for one minute = 4.5 watt.

Power developed for 60 min (1 hr) = 270 watt/hr.

Power developed for 24 hrs = 6048 KW/day.

IV.ADVANTAGES

1. Pollution free power generation.
2. No fuel storage is required.
3. Energy available all year around.
4. Maximum utilization of energy.
5. Uninterrupted power generation during day and night.

V.APPLICATIONS

Power generation using flip plate mechanism can be used in most of the places such as:

1. This technique can be used in all highways.
2. Street Lights.
3. Road Signals.
4. Signal boards on the roads.
5. Lighting of the bus stops.
6. Lighting of the check post on the highways etc.

VI.CONCLUSION

Road Power Generation is a new type of unconventional source of energy. This uses wasted energy of moving vehicles. It converts kinetic energy developed from moving vehicles to electric energy. RPG is possible answer for battery charging station and also for the lightning of the street light. The higher frequency of passing vehicles provides higher capacity.

VII.SCOPE FOR FUTURE EXPANSION

This paper is designed for road power generation is specifically used on entrance and exit of school, college and companies. It can be installed at toll booths, bus stands, airports and railways parking zone.

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