Electrical Power Generation through Speed Breaker

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ABSTRACT: In the present situation power becomes basic need for human life. Energy is responsible for major developments of any country's economy. Conventional energy sources generate most of the energy of today's world. But the population is increasing day by day and the conventional energy sources are diminishing. Moreover, these conventional energy sources are polluting and responsible for global warming. So, nonconventional sources are needed to be developed for power generations which are clean, environment friendly and sustainable. In this research, we propose a renewable non-conventional energy source based on speed breaker mechanism. Our project is to enlighten the streets utilizing the jerking pressure which is wasted during the vehicles passes over speed breaker in roadside. We can tap the energy generated by moving vehicles and produce power by using the speed breaker as power generating unit. The kinetic energy of the moving vehicles can be converted into mechanical energy through rack and pinion mechanism and this mechanical energy will be converted to electrical energy using generator which will be used for lighting the street lights. Therefore, by using this mechanism we can save lot of energy which can fulfill our future demands.
Keywords: kinetic energy, speed breaker, rack & pinion, generator, non-conventional energy

I INTRODUCTION

An energy crisis is any great bottleneck (or price rise) in the supply of energy resources to an economy. It usually refers to the shortage of oil and additionally to electricity or other natural resources. An energy crisis may be referred to as an oil crisis, petroleum crisis, energy shortage, electricity shortage, electricity crisis.Increasing demand of energy adds to the need of identifying non-conventional resources of energy. In my paper, I will discuss about power generation from speed breaker and the possible mechanism required for it.

This project is about generation of electricity with the speed breakers. Generally when

vehicle is in motion it produces various forms of energy like, due to friction between vehicle's wheel and road i.e. rough surface heat Energy is produced, also when vehicle traveling at high speed strikes the wind then also heat energy is produced which is always lost in environment and of which we can't make use of it or directly we can say that all this energy that we can't make use of is just the wastage of energy that is abundantly available around us. In this project we are just trying to make use of such energy in order to generate an electrical energy. this project will work on the principle of "potential energy to electrical energy conversion" Potential energy can be thought of as energy stored within a physical system. This energy can be released or converted into other forms of energy, including kinetic energy. It is called potential energy because it has the potential to change the states of objects in the system when the energy is released.

1.1 BASIC PRINCIPLES
•Simple energy conversion from mechanical to electrical.
•To generate electricity using the vehicle kinetic energy as input
•We can develop electricity from speed breakers
•They are using 3 different mechanisms:
I. Roller mechanism
II. Rack- Pinion mechanism
III. Crank-shaft mechanism

1.2 SECTION MAIN HEADING
Speedbreaker, spring arrangement, hydraulic press, rack and pinion combination, freewheeling and gear combination, generator, charging circuit, battery, dark sensing & switching circuit, inverter circuit and stepup transformer used to the system in this research work

A.   Speed breaker
It is the top portion of the system which is made of iron in curved shape. The main function of this speed breaker is to sustain the pressure of vehicle and squeezes it when vehicle passes

through it.
B. Spring arrangement
A spring is an elastic body whose function is to distort when loaded and to recover its original shape when the load is removed. It cushions, absorbs or controls energy either due to shocks or due to vibrations.There are four helical springs below the speed breaker which are squeezed when vehicle pressurizes upon it and it bring the speed breaker at previous state.

C. Hydraulic press
In a hydraulic press a small force applied on a column of liquid is converted into a much greater force available to another column of liquid. It is an application of Pascal law. In our proposed system it converts the force into 4times from small piston to arrange piston when the pressure created on speed breaker using the equation

D. Rack &Pinion
Rack and pinion can convert rotary to linear of from linear to rotary motion. Rack is a linear gear and pinion is a circular gear. Applied force on rack is converted to rotation by pinion.Themechanicalforceisconvertedintorotationalforce.
E. Flywheel
The primary function of flywheel is to act as an energy accumulator. Itreducesthefluctuationsinspeed. It absorbs the energywhendemandislessandreleasesthesamewhenitis required.
F. Generator
The device which converts mechanical energy intoelectrical energy is called generator. An AC generator is used for producing alternating current which contains an assembly of stationary (stator) and moving parts (rotor). The rotor is connected with the gear. The torque which generated by gear rotates the rotor of the generator. The rotor creates a moving magnetic field around the stator, which induces a voltage difference between windings of stator and produces the alternating current (AC) output of the generator.
G. Charging circuit
Charging circuit is used to charge the battery.
H. Dark sensing and switching circuit
Dark sensing circuit senses the dark and switches the light on.
I. Inverter circuit & step-up transformer
Inverter convert DC voltage to AC voltage and step-up transformer is a type of transformer which stepped up the AC voltage. In this system inverter circuit converts 12VDCto15V AC. Step up Transformer makes the voltage to 250 V AC from 15 VAC.

II WORKING
Now there are many new and innovative concepts get introduced i.e. generating electricity from a speed breaker. Producing electricity from a speed breaker 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 roller then we can produce considerable amount of electricity, this is the main concept of this project. In this project, a roller is fitted in between a speed breaker and having a grip is provided on the speed breaker so that when a vehicle passes over speed breaker it rotates the roller. This movement of roller is used to rotate the shaft of D.C. generator by the help of chain drive which is there to provide 1:5 speed ratio. As the shaft of D.C. generator rotates, it produces electricity. This electricity is stored in a battery. Then the output of the battery is used to lighten the streetlamps on the road. Now during daytime, we don't need electricity for lightening the streetlamps so we are using a control switch.The control switch is connected by wire to the output of the battery. The control switch has ON/OFF mechanism which allows the current to flow when needed.
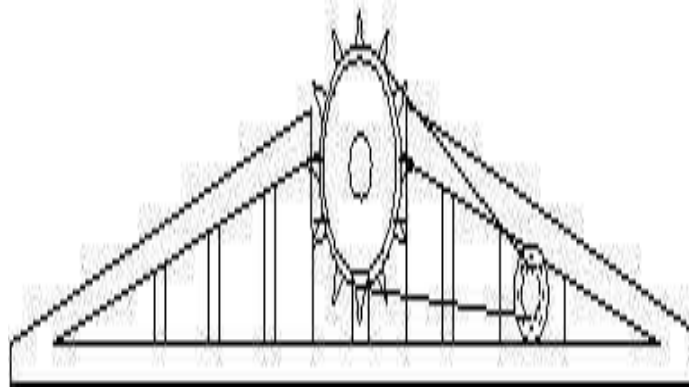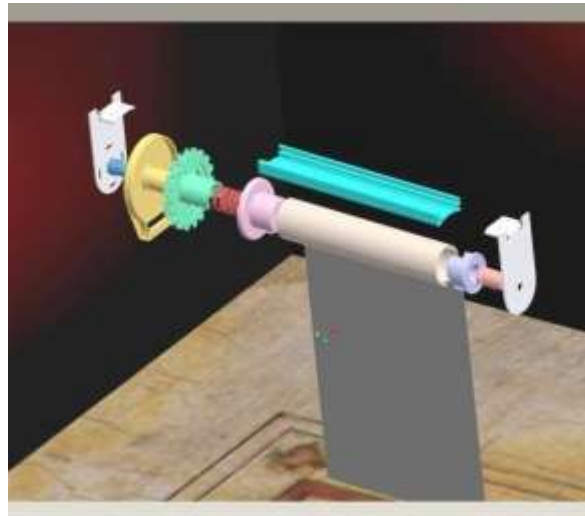
Fig 1 Roller mechanism
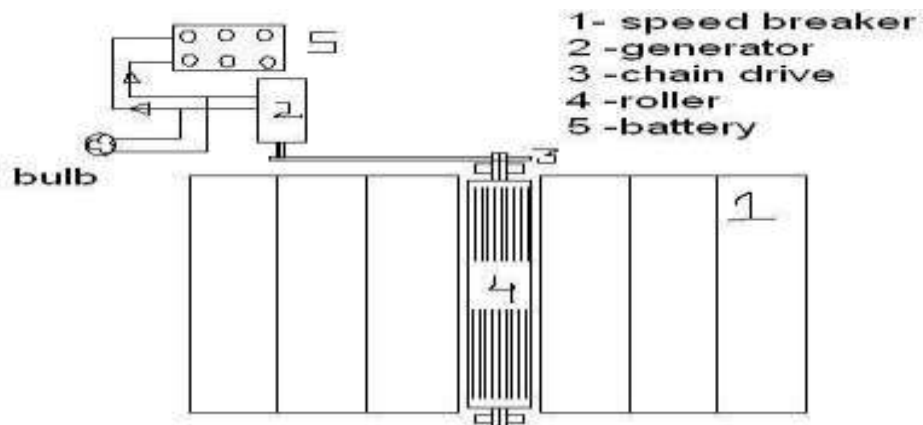Fig 2.1. Electricity generation from of roller mechanism

1- speed breaker
2 -generator
3 -chain drive
4 -roller
5 -battery

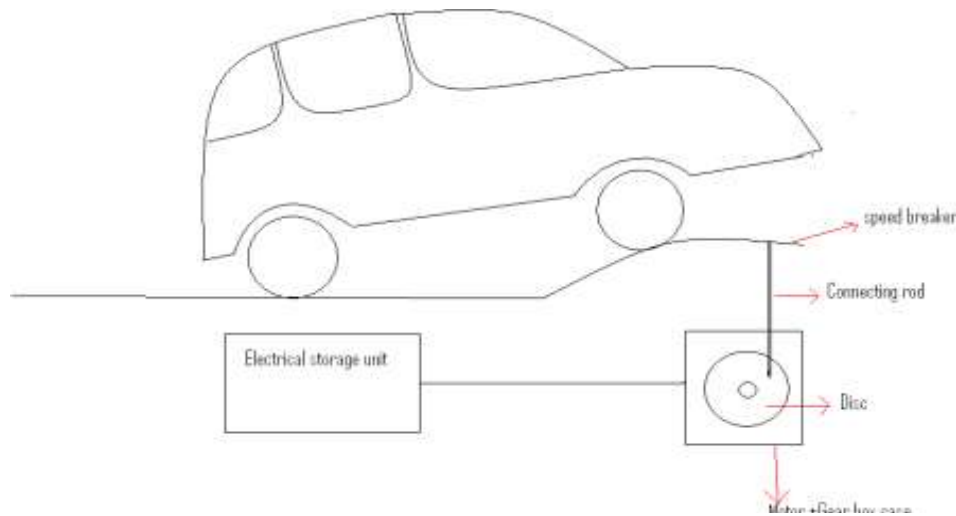Fig 2.2. Electricity generation from of roller mechanism

Fig 3. Electricity generation from of rack and pinion mechanism

III POWER CALCULATIONS & RESULT ANALYSIS

Let's consider,

The mass of vehicle moving over the speed breaker = 350Kg (Approximately)

Height of speed breaker = 15 cm

Weight of the Body = 350 Kg × 9.8 = 3430 N

Distance travelled = Height of the speed breaker = 15cm Work done

= weight of the body × distance travelled by the pressure of vehicle

Power = Work done/Second

= (3430×0.15)/60 = 8.58 Watts Output Power developed for 1 vehicle passing over the speed Power developed for 60 minutes (1 hr.) = 514.5 watts Power developed for 24 hours = 12.35 Kw

Our proposed system can provide 250 v and 24 amp.

We are using CFL bulb (100 watt)

In one km 60 bulbs are needed.

Total watt = 60×100 = 6000 watt = 6 Kw

This power generated by vehicles is more than sufficient to run four street lights in the nighttime

IV ADVANTAGES

1. Using this proposed technology we can get the following advantages
2. Non polluting power generating source
3. Power generation with low cost.
4. Simple construction, mature technology.
5. Less floor are required and no obstruction to traffic.
6. No need of manual work during power generation.
7. Low installation and maintenance cost
8. Power generation using non-conventional energy sources.
9. Easy for maintenance and no fuel transportation problem.
10. Simple construction, mature technology, and easy maintenance.

V DISADVANTAGES

1. Selecting suitable generator.
2. Selection of springs.
3. Achieving proper balance of speed and torque.
4. It gives low electric output

VI CONCLUSION

Electricity plays a very important role in our life. Due to population explosion, the current power generation has become insufficient to fulfill our requirements. In this project we discover technology to generate electricity from speed breakers in which the system used is reliable and this technique will help conserve our natural resources. In coming days, this will prove a great boon to the world, since it will save a lot of electricity of power plants that gets wasted in illuminating the street lights. As the conventional sources are depleting very fast, it is high time to think of alternative resources. We got to save the power gained from the conventional sources for efficient use. So, this idea not only provides alternative but also adds to the economy of the country.

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