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Generation of Electricity Through Rack and Pinion

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***Abstract*— In this paper we illustrate generation of electricity through speed breakers. Here we used a technique of harvesting energy by three mechanisms- Rack and pinion mechanism, Crank and shaft mechanism, Roller mechanism. In this paper we have used roller 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, heat developed during motion and energy of wind striking is given to roller attached beneath it. Then the roller passes the energy to spring and spring passes it to dynamo which converts mechanical energy to electrical energy. 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.**

Keywords*— *Component; Formatting; Style; Styling; Insert

I. INTRODUCTION

In India many of the people are facing with the problem of electricity. Of those who did their effort all find electricity supply intermittent and unreliable. In India there is lack of clean and reliable energy sources such as electricity. About 1000 million people in India are still using traditional biomass energy sources such as fuel wood, agricultural waste and livestock dung – for cooking and other domestic needs. This traditional fuel combustion in India causes air pollution which causes about 500,000 deaths per year and other chronic health diseases.

Carbon dioxide (CO2) produces from India 'thermal power plant is about 50 to 120 percent more than that carbon dioxide is produce in European union countries (EU-27) from coal-fired, oil-fired and natural gas-fired thermal power plants.

The largest problem of electricity in India was seen on July 2012. In history in July 2012 India blackout was the largest power outage due to occurring of two events on 30 and 31 July 2012. This outage of power affected 700 million people which is about 9% population of the world or half of India's population, spread across 22 states in Northern, Eastern, and Northeast India. During this event of outage power approx 32giga watts of generating capacity was taken offline. According to an article given in The Wall Street Journal which stated that, 320 million initially had power, while the rest of the affected population lacked direct access of the total affected people. [1]

In this paper roller is directly connected to mechanical arrangement which consist of chain & sprocket & rack & pinion. This mechanical arrangement is directly connected to shaft which is connected to the rotor of the motor. This rotor contains a magnet which when turned produce rotating magnetic field which in turn produces electromotive force. The rotor is surrounded by stator which is nothing only a stationary case, which contains the wound copper coils or windings. When the moving magnetic field passes through these wound copper coil or windings, they generate electricity. On controlling the speed at which the rotor is turned, a steady flow of electricity is produced in the windings. These windings of the rotor are connected to the electrical network by transmission lines. This concept it is known as "reciprocating bump". The speed breaker designed such that it is supported on springs. When a vehicle mounts on the speed breaker, the load on the springs causes a movement which is converted to a rotary motion by using the rack and pinion mechanism. Hence the energy is generated and can be stored in batteries or any other equippments. The input for producing energy is the weight of the vehicle. motion to a DC motor for electricity generation.

II. EXPERIMENTAL SETUP

An iron roller is fixed beneath wooden ramp on which vehicle passes. As vehicle goes over it starts moving. A connection is attached which transfer the motion to a DC motor for electricity generation. This is a new concept undergoing research. The number of vehicles on road is increasing rapidly and if we convert kinetic energy of vehicles into the rotational motion of roller which is converted into electricity. This is the main concept of this paper. In this paper, a roller is fixed in between a speed breaker and there is a type of grip provided on the speed breaker so that when a vehicle passes over speed breaker it rotates the roller. By the movement of roller we can rotate the shaft of D.C. generator by the chain drive which provides 1:5 speed ratios. As the shaft of D.C. generator rotates, it produces electricity. Battery is used to store electricity. This electricity is used to glow street lamps. During daytime we don't require to lighten up the street lamps. So we are controlling this operation using a switch which is connected to the battery through a wire. A car or any heavy vehicle moving with a speed of 100 mph and passing over this roller attached to the road then this roller moves with 90 mph (due to losses). So a cycle is coming with a speed of 20 mph and passes this roller (which is moving at a speed of 90 mph). There will be a collision because of difference in the speed. This is the main reason for using speed breakers. A connection is provided which transfer the motion to a DC

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alternator for electricity generation. The set up for the experiment is given in Fig.1

Fig.1. Experimental Setup

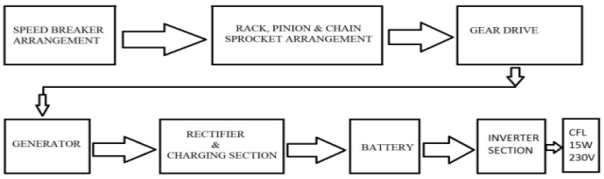


Fig.2 Proposed Block Diagram

Equipments used are described as follows. The rack and pinion is used to convert between rotational motions into linear motion. The rack is flat and gear has the teeth which is called pinion. Rack and pinion can convert from between rotational and linear motion. Here motion is converted with speed gain. Chain & sprocket arrangement uses a gear of 24 teeth (a pair) connected with the chain which is used to increase revolution per minute (rpm). Full wave bridge rectifier uses four diodes (IN4007) as shown in Fig.3.It is preferred over centre tapped rectifier because of three reasons. First it is less costly than centre tapped. Secondly it has peak inverse voltage half of centre tapped. It also prohibits back flow of power from alternator to battery. An alternator which is dynamo without commutator is used to convert mechanical energy to electrical energy. Alternator with a stationary armature in a rotating magnetic field is used as shown in Fig.4.

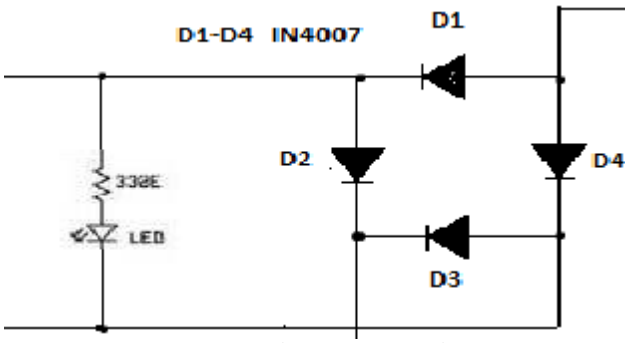


Fig.3 Half wave bridge rectifier

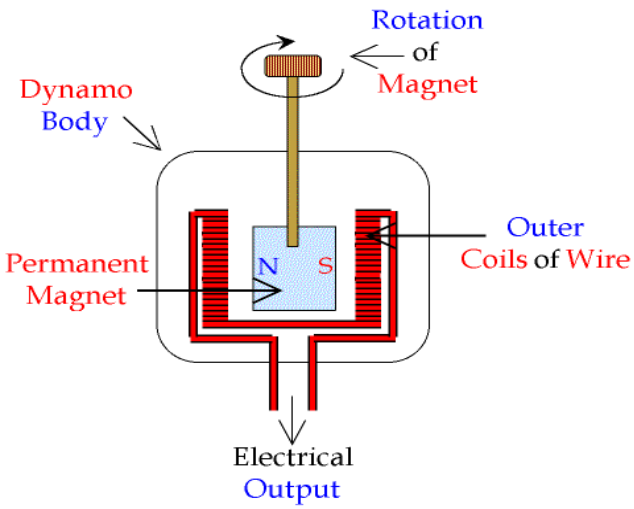


Fig.4 Alternator

III. CALCULATION AND RESULTS

This paper proposed a technique where a roller is fixed in between a speed breaker and there is a type of grip provided on the speed breaker so that when a vehicle passes over speed breaker it rotates the roller. By the movement of roller we can rotate the shaft of D.C. generator when shaft of generator rotates then it generates electricity by the following formulas:-The following performance characteristics is shown in fig.6.

$P = T \times S$

Where: T is torque generated by dynamometer
S is the shaft speed

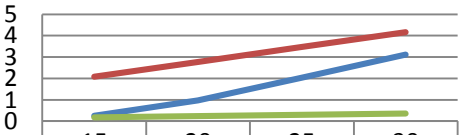
$T = F \times D$

Where: F is friction force due to rotation of shaft
D is the distance of shaft from the pivot

$F = aV^2 + b$

Where: a is coefficient for two wheel vehicle
b is reference weight of vehicle in k.g

Performance specifications



	15	20	25	30
Current (mA)	0.25	0.97	2.03	3.11
Voltage (V)	2.0825	2.776	3.47	4.164
Power(W)	0.17658	0.23544	0.2943	0.35316

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IV. 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 no where 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. In this paper we described about a technology to generate electricity from speed breakers which is reliable and will help in conserving our natural resources

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