

Generation of Electricity through Speed Breaker Mechanism

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Abstract - This paper is presenting the study of electricity generation through the speed breaker mechanism. For obtaining the electricity through the speed breaker mechanism a prototype model is developed and studied. Findings from this research work is discussed in this paper , The generator used here is permanent magnet D.C. generator. The generator voltage is 12 Volt D.C. This D.C. voltage is stored to the lead 12-volt battery. The battery is connected to the inverter. The inverter is used to convert 12 volt D.C. to the 230 volt A.C[3]. voltage is used to activate the light fan etc. By increasing the capacity of the battery and the inverter circuit the power rating is increased.

Keywords: electric power, speed breaker, inverter, lead acid battery, permanent magnet D.C. generator

I. INTRODUCTION

Energy is the primary and most universal measure of all kinds of works by human beings and nature. Every thing what happens in the world is the expression of flow of energy in one of its forms. Most people use the word energy for input to their bodies or to the machines and thus think about crude fuels and electric power.[5]

Energy in the form of electricity plays a very important role in the life of a normal man. Electricity is one of the greatest wonders of science. Next to man, it is the most important and revolutionary creation in this world of ours .It has practically revolutionized the world .The gradual but excessive use of electricity has come to bring about a stupendous changes in industry. With it our modern gigantic tools are worked. Computers as also calculators sum up totals and make other calculations with the utmost accuracy. Newspapers and books are printed in millions overnight. There is not a single phase of human life that is not indebted to electricity for its progress .The modern age has, therefore, been truly called the “age of electricity.” [7]

We do many things with electricity nowadays. We warm our homes, we drive the machines in factories, we run our trains and buses. Electricity has completely revolutionized the methods of travel and transport .It has enabled us to travel in aeroplanes and fly into cold atmosphere of the sky. We also have electric trains in our country.[1]

So 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 things used in day-to-day life[6]. In this project we have tried to generate electricity through speed breakers present on roads. As we know that vehicles on road 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 road etc.

This set up requires very basic mechanical components such as gear shaft bearing. There are also some electrical components such battery, inverter etc.

II. PRINCIPLE OF WORKING

The principle of the electric power generation using speed breaker 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[2]. 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 speed breaker is converted into the rotational motion, which in turn rotates the generator and generates electricity.

III. NAME OF THE COMPONENTS

components are used in the generation of electricity power using speed breaker are as follows.

S.No.	Name of the Component
(1)	Springs
(2)	Gears
(3)	Chain drive
(4)	Shaft
(5)	Bearing
(6)	D.C. Generator
(7)	Battery
(8)	Inverter

IV. COMPONENTS LIST WITH THEIR SPECIFICATION

S.No.	Name of the Component	Specification
1.	Motor:	(i)Voltage : 12 (ii)Type: D.C. Generator (iii) RPM: 1200rpm
2.	Gear:	(i)Material : Mild Steel (ii) No. of teeth : 56(big gear) (iii)No. of teeth : 48(small gear) (iv) Type: Spur gear (v)No.of gear used:2
3.	Spring :	(i) Load bearing capacity :6- 7kg (ii)Material: Mild Steel (iii)Total displacement: 2 inch
4.	Chain & Sprocket:	(i) Number of teeth on big sprocket :48 (ii)Number of teeth on small sprocket 19 (iii)Distance between the center 16 cms

5.	Bearing	(i) Type: Rolling contact bearing (ii) Bearing no. N40
6.	Shaft:	(i) Diameter : 8mm (ii) Material : Mild steel (iii) Length : 381mm

V. CONSTRUCTION

This setup mainly consist of an arrangement which is having a shaft with a U shaped projection carrying a bearing and is connected to the top of the speed breaker. The bearing is provided in order to permit the relative motion between the shafts. In this way vertical motion is to be converted into rotational motion. The top of the speed breaker will be provided with the return spring in order to retain its position after it will be displaced by the weight of the vehicles in the downward direction. The spring is designed depending on the weight of the vehicles passing through it. The two ends of the shaft will be fixed with the help bearing. The shaft is made of mild steel. This shaft will also be provided with the sprocket, as it will rotate in direction of the shaft. This sprocket will be connected with another sprocket with the help of chain drive, which is mounted on the other shaft this action is like the bicycle arrangement. The lower shaft also consists of a gear. A gear is also mounted on the generator and is meshing with gear on the lower shaft this will help to rotate the D.C. generator and in turn will generate electrical power, which will be stored in the battery and can be used accordingly.

The generator used here is permanent magnet D.C. generator. The generate voltage is 12 Volt D.C. This D.C. voltage is stored to the lead 12-volt battery. The battery is connected to the inverter. The inverter is used to convert 12 volt D.C. to the 230 volt A.C. voltage is used to activate the light fan etc. By increasing the capacity of the battery and the inverter circuit the power rating is increased. This arrangement is fitted in highways; the complete arrangement is kept inside the floor level except the speed brake arrangement.

VI. BLOCK DIAGRAM

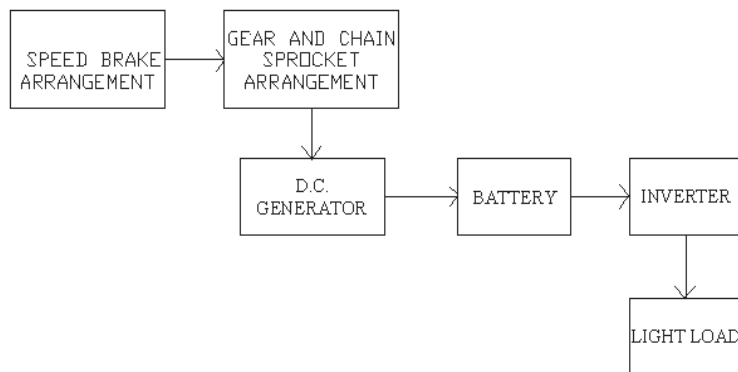
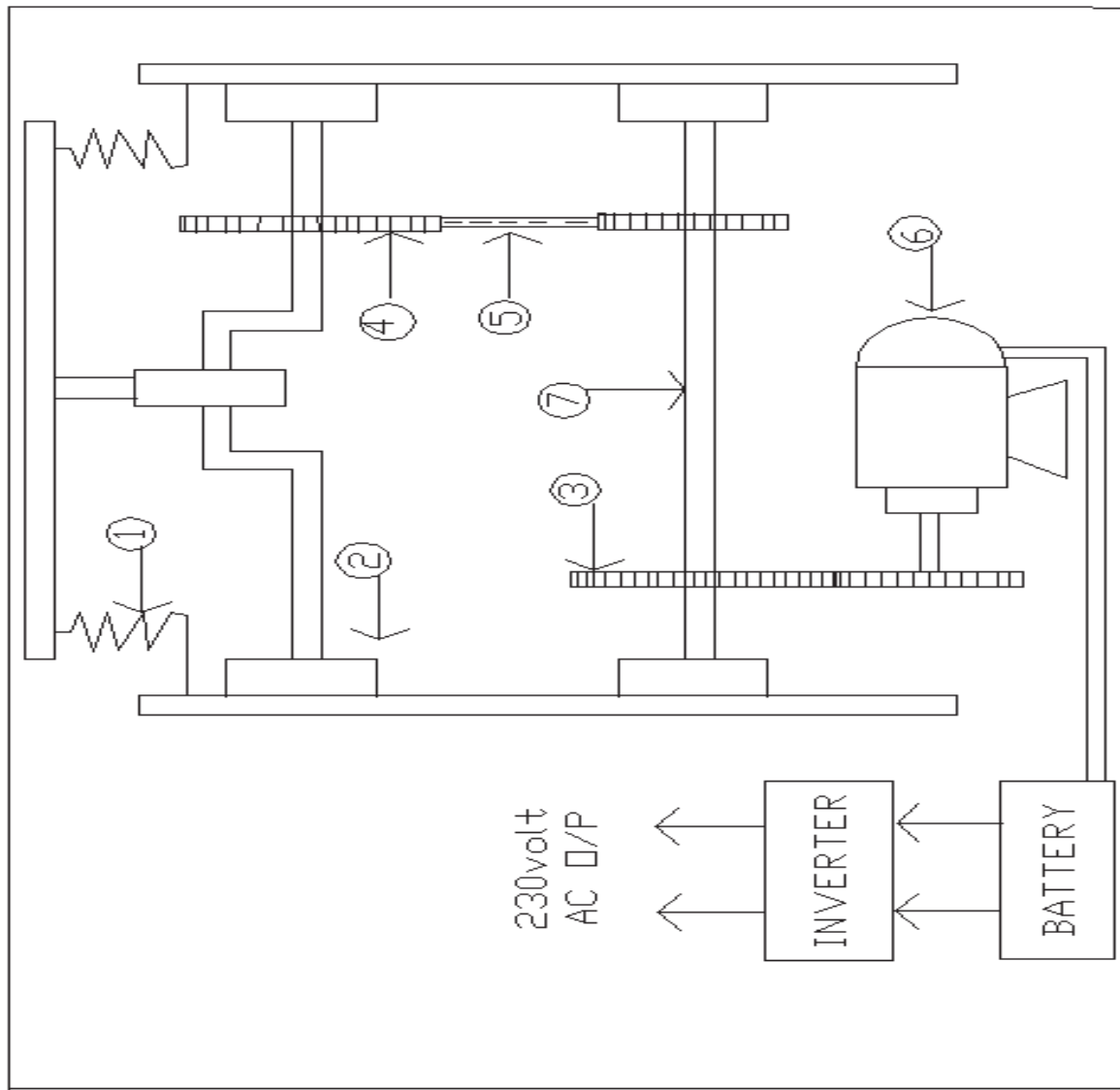


Fig.1 Arrangements of different components

VII. LINE DIAGRAM



- 1. SPRING
- 2. BEARING
- 3. GEAR WHEEL
- 4. SPROCKET
- 5. CHAIN DRIVE
- 6. D.C. GENERATOR
- 7. SHAFT

Fig.2 Mechanism of electricity generation through the speed breaker

VIII. WORKING OF THE MODEL

The working of this speed breaker arrangement for producing electricity is very simple. There are a large number of automobiles running on the road. These automobiles go over a number of speed breakers present on the road. The vehicle is having a variety of weight like trucks, buses, cars, and two wheelers therefore whenever they are passing

over a speed breaker a lot of energy is wasted. So when the vehicle will come on the speed breaker because of its weight the top portion of the speed breaker moves down wards and the shaft consisting of the U portion rotated in a particular direction. Due to this rotation of the shaft the sprocket will rotate and the rotational energy from one shaft is transferred to the other shaft with the help of chain drive mechanism. This rotates the gear on the bottom shaft, which in turn will help to rotate the gear placed on motor. This rotation of the gear starts the generator and generates electricity which can be stored in the battery and can be converted in a.c. current using inverter and used for lighting of the lamps, signals sign boards on the road.

On the other hand when the vehicles have passed over the bump the top will retain its position with the help of the spring provide and the chain drive will rotate in the reverse direction without rotating the gears as in case of the bicycle where the bicycle moves ahead when force is applied on the pedal. But when the pedal is rotated in the reversed direction the bicycle moves in the reverse direction. Thus power is generated only during the downward motion and not in the reversed motion of the top portion of the breaker.

This principle can also be used in the steps of the staircase to produce electricity. In which whenever a person puts his foot on the step due to his weight the step gets displaced in the down ward direction and will rotate the rotor of the generator in same manner as in case of speed breaker arrangement. And thus electric power can be generated which can be used in lightning of the buildings.

IX. APPLICATIONS

Power generation using speed breaker system can be used in most of the places such as:

- This technique can be used in all highways.
- This technique can be used in all roadways Speed brake.

This mechanism of generating of electricity can be placed on the actual speed breaker of the roads. The power is generated when the vehicles pass through it. Which in can be stored in the battery. This power can be used in many places after using the inverter, which enhances in the voltage from 12 volts to 230 volts. This power can be used in the following:

- Street Lights.
- Road Signals.
- Sign boards on the roads.
- Lighting Of the bus stops.
- Lighting of the check post on the highways etc.

X. CONCLUSION

This methods have many advantages such as Power generation does not require any fuel input, Running cost is very less, This is a non-conventional form of energy and therefore very useful in the present scenario of energy crisis. As coin has two faces in the same way there are also some disadvantages such as Mechanical moving parts is high and therefore there are very large frictional losses and therefore require more maintenance, Initial cost of this arrangement is very high. The overall efficiency is quite low as compared to other techniques.

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