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Speed breaker device for generation of Electricity

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Abstract- ***Energy is the first (or most important) need for survival of all organisms in the universe. In this paper we are trying to use one such source. Electricity is created by replacing the usual speed breakers with some simple (machine/method/way). . The basic rule/way of thinking is simple energy (changing from one form, state, or state of mind to another) form mechanical to electrical energy by using the vehicles weight (possible energy) & movement ((movement-related) energy). Our paper includes how to use the energy which is wasted when the vehicles passes over a speed breaker..Here the process of Electric Power The (movement-related) energy of the moving vehicles can be converted into mechanical energy of the shaft through rack and pinion (machine/method/way). Then, this mechanical energy will be converted to vac electrical energy using generator which will be saved with the use of an electrical storage device Generation comes under the (machine/method/way) of Electro-(movement-related) power Generator.***

*Keywords-****Speed breaker, Kinetic energy, electric power,vehicles, mechanical energy .***

I. INTRODUCTION

Energy is the first 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 so think about fuels and electric power. According to statistics given by the Ministry of Road Transport & Highways, Government of India, in 2002, 58.8 million and in 2004, 72.7 million vehicles were playing on Indian roads. The once-a-year rate of growth of motor vehicle population in India has been almost 10 percent during the last ten years. There is huge (motor vehicle-related) growth in India year by year [1].Increasing demand of energy adds to the need of identifying non-ordinary useful things supplies of energy. In my paper, I will discuss about power generation from speed breaker and the possible (machine/method/way) needed for it.We also have electric trains in our country.This set up needs very basic mechanical parts such as gear shaft bearing. There are also some electrical parts such electrical storage device, inverter etc.[2]

II. SCOP OF PROJECT

The utilization of energy is an indication of the growth of a nation. For example, the per capita energy consumption in USA is 9000 KWh (Kilo Watt hour) per year, whereas the consumption in India is 1200 KWh (Kilo Watt hour). One might conclude that to be materially rich and prosperous, a human being needs to consume more and more energy. A recent survey on the energy consumption in India had published a pathetic report that 85,000 villages in India do not still have electricity. Supply of power in most part of the country is poor according to the study by Priyadharshini.M in “Every Speed Breaker Is Now A Source of Power” [2]. Hence more research and development and commercialization of technologies are needed in this field. India, unlike the top developed countries has very poor roads. Talking about a particular road itself includes a number of speed breakers. By just placing a unit like the “Power Generation Unit from Speed Breakers”, so much of energy can be tapped. This energy can be used for the lights on the either sides of the roads and thus much power that is consumed by these lights can be utilized to send power to these villages.

III. 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.

IV. NAME OF THECOMPONENTS

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

TABLE 1: COMPONENTS LIST WITH THEIRSPECIFICATION

S.No.	Name of the Component	Specification
1.	Motor:	(i)Voltage :12 (ii)Type: D.C.Generator (iii)RPM:1200rpm
2.	Gear:	(i)Material : MildSteel (ii)No. of teeth : 56(big gear) (iii)No. of teeth : 48(smallgear) (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 contactbearing (ii)Bearing no.N40
6.	Shaft:	(i)Diameter :8mm (ii)Material : Mildsteel (iii)Length :381mm

V. CONSTRUCTION

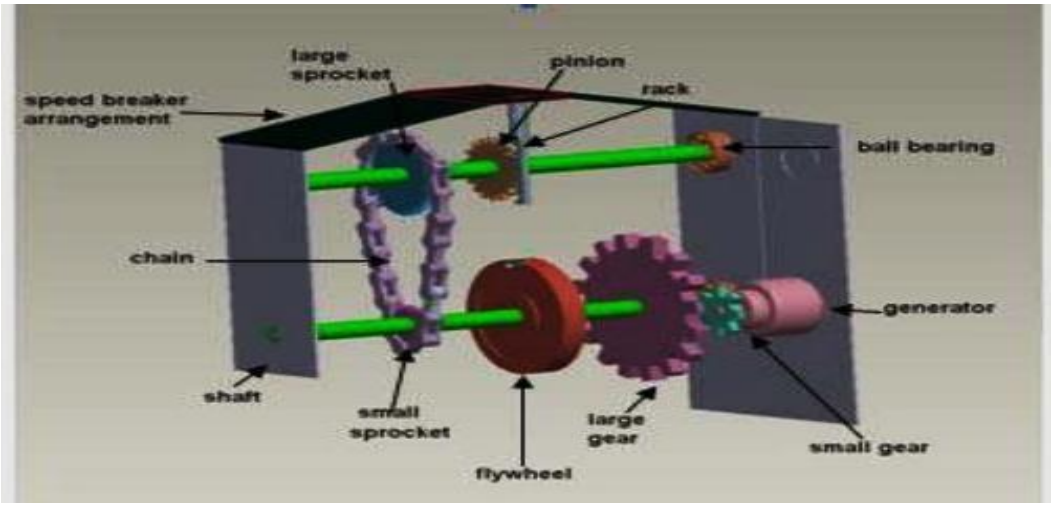

Figure.1 constructional detail

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 usedaccordingly.

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 brakearrangement.

VI. BLOCK DIAGRAM

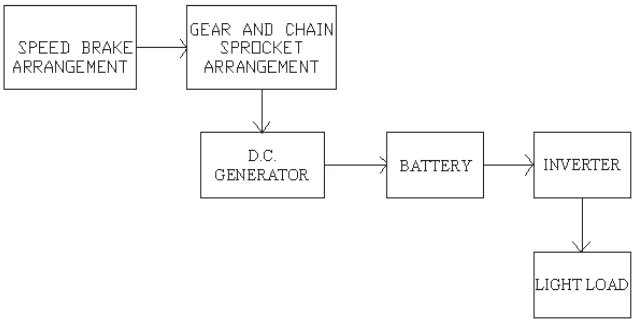

Figure.2 Arrangements of different components

6.1 LINE DIAGRAM

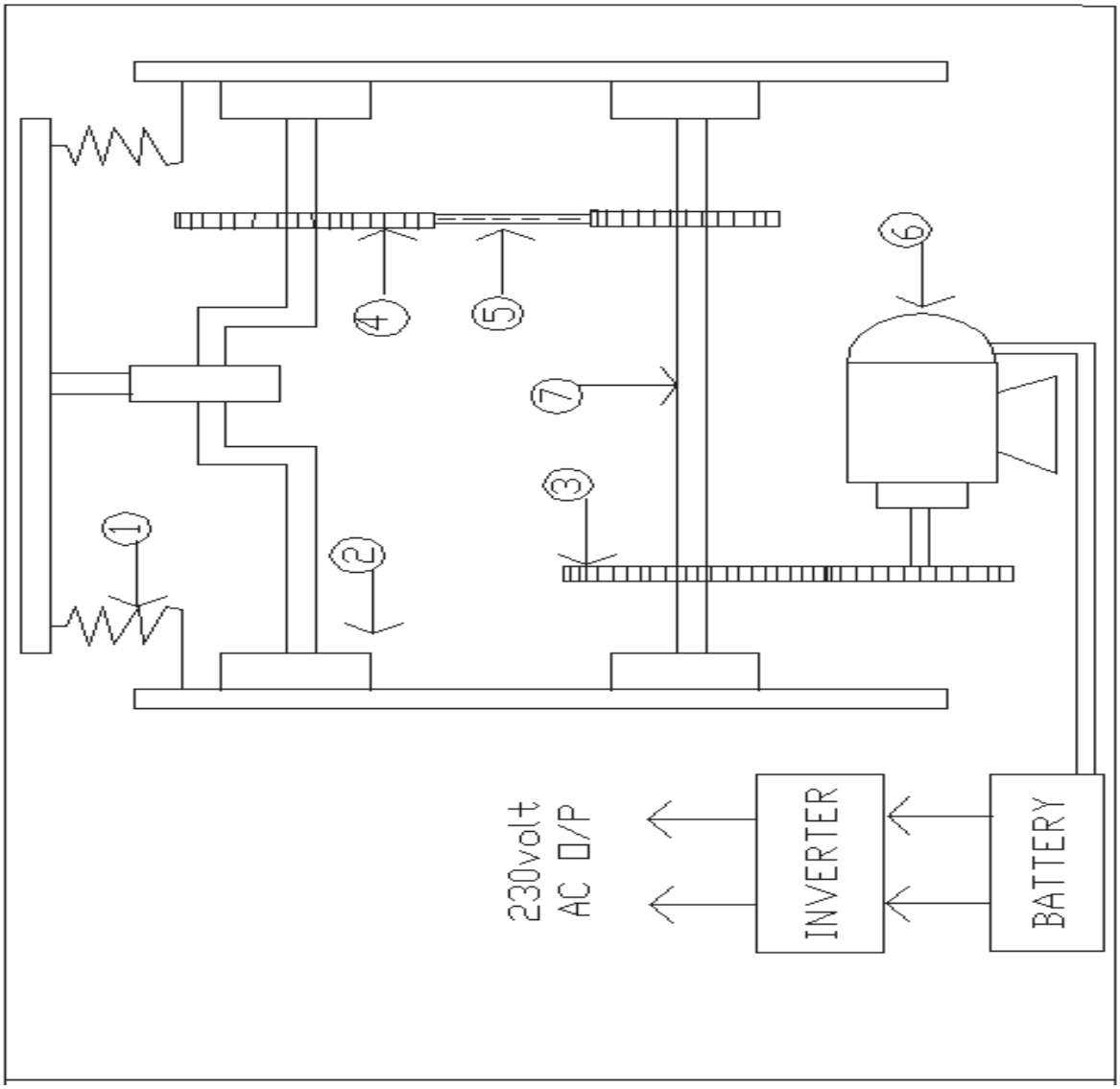

Figure.3 Mechanism of electricity generation through the speed breaker

VII. 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 wheeler 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 invert er 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.

VIII. POWER CALCULATIONS

Let us consider,
The mass of any vehicle travailing over the speed breaker= 300Kg (Approximately)
Height of speed brake = 15 cm
Work done = weight of the body x distance traveled by the vehicle
Here,
Weight of the Body = 300 Kg x 9.81 = 2943 N
Distance traveled by the body = Height of the speed breaker = 15cm
Power = Work done/Second = (2943 x 0.15)/60 = 7.3575 Watts
Output Power developed for 1 vehicle passing over the speed Breaker arrangement for one minute = 7.3575 watts
Power developed for 60 minutes (1 hr) = 441.45 watts
Power developed for 24 hours = 10.5948 Kw
This power generated by vehicles is more than sufficient to run four street lights in the night time.

Table2: VEHICAL LOAD CORRESPONDIND VOLTAGE AND CURRENT

Load (Kgs)	Voltage(Volts)	current(Amps)
135	2.3	0.1
205	3.1	0.22
270	4.08	0.31

300	5.5	0.42
440	7.2	0.6
600	8.6	0.74

IX. APLLICATIONS

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

- This technique can be used in allhighways.
- This technique can be used in all roadways Speedbrake.

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:

- StreetLights.
- RoadSignals.
- Sign boards on theroads.
- Lighting Of the busstops.
- Lighting of the check post on the highwaysetc.

X. CONCLUSION

We need electricity for every small thing. More suitable and compact mechanisms to enhance efficiency. So, this is a small step to try to improve this situation by this project and contribute something for the society. Although less electrical output is being generated. The idea of generating electricity from kinetic energy of the moving vehicles has successfully implemented.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.

10.1 Future Scope

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.This project can be designed for heavy vehicles, thus increasing input torque and ultimately output of generator can also be increased by using the multiple transmission system which is more efficient method for generating electricity.so, to work on improve efficiency.

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