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POWER GENERATION USING SPEED BREAKER

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ABSTRACT
In this paper we are generating electrical power as non-conventional method by simply running on the train in the speed breaker. Non-conventional energy system is very essential at this time to our nation. Non-conventional energy using speed breaker needs to fuel input power to generate the output of the electrical power. This project using simple drive mechanism such as rack and pinion assemble and chain drive mechanism.
For this project the conversion of the force energy in to electrical energy. The control mechanism carries the rack and pinion, D.C generator, battery and inverter control. We have discussed the various application and further extension also. So this project is implemented to all speed breaker, the power generation is very high. This initial cost of this arrangement is high.

Keywords:
Speed breaker, pinion, Chain drive, battery

I. INTRODUCTION
An innovative and useful concept of Generating Electricity from a Speed breaker is our step to improve the situation of electricity. First of all what is electricity means to us? Electricity is the form of energy. It is the flow of electrical Power. Electricity is a basic part of nature and it is one of our most widely used forms of energy. We get electricity, which is a secondary energy source, from the conversion of other sources of energy, like coal, natural gas, oil, nuclear power and other natural sources, which are called primary sources. Many cities and towns were built alongside waterfalls that turned water wheels to perform work. Before electricity generation began slightly over 100 years ago, houses were lit with kerosene lamps, food was cooled in iceboxes, and rooms were warmed by wood-burning or coal-burning stoves. Direct current (DC) electricity had been used in arc lights for outdoor lighting. In the late-1800s, Nikola Tesla pioneered the generation, transmission, and use of alternating current (AC) electricity, which can be transmitted over much greater distances than direct current.

II.LITERATURE REVIEW
From the journal paper, a prototype is constructed and an experimental study is performed. Three different masses, 41 kg, 65 kg and 80 kg, are applied on the speed-breaker systems and the produced amounts of voltage, current and angular speed are measured. It was observed (Figure 3-a) that as the mass increases the produced voltage increases linearly. For illustration a mass of 41 kg, produces 5.0V. This voltage reaches 15.6 V for a mass of 65 kg and 21.5 V for a mass of 80 kg. Designing energy recovery systems that are pollution free has become a significant goal within the research community. One of numerous systems that have been proposed is Speed Bump Power Generator SBPG system that produces electrical power by utilizing the movements of commuting vehicles on highways, boulevards, and streets. Consequently, a kinetic energy is produced and transferred into electrical power. In this

paper, different types of SBPG systems are presented. An experimental analysis is performed on the rack-and-pinion system. Results have shown that electrical power up to 45 W generated when a mass of 80 kg is applied to SBPG system considered. Extrapolation of results confirms around 0.56 kW powers can be produced when various vehicles with different masses pass through the bumps.

III.TYPES OF MECHANISMS

We can develop electricity from speed breakers by using 3 Mechanisms basically They are as follows:

1) Roller mechanism
2) Crank-shaft mechanism
3) Rack-pinion mechanism

Roller Mechanism

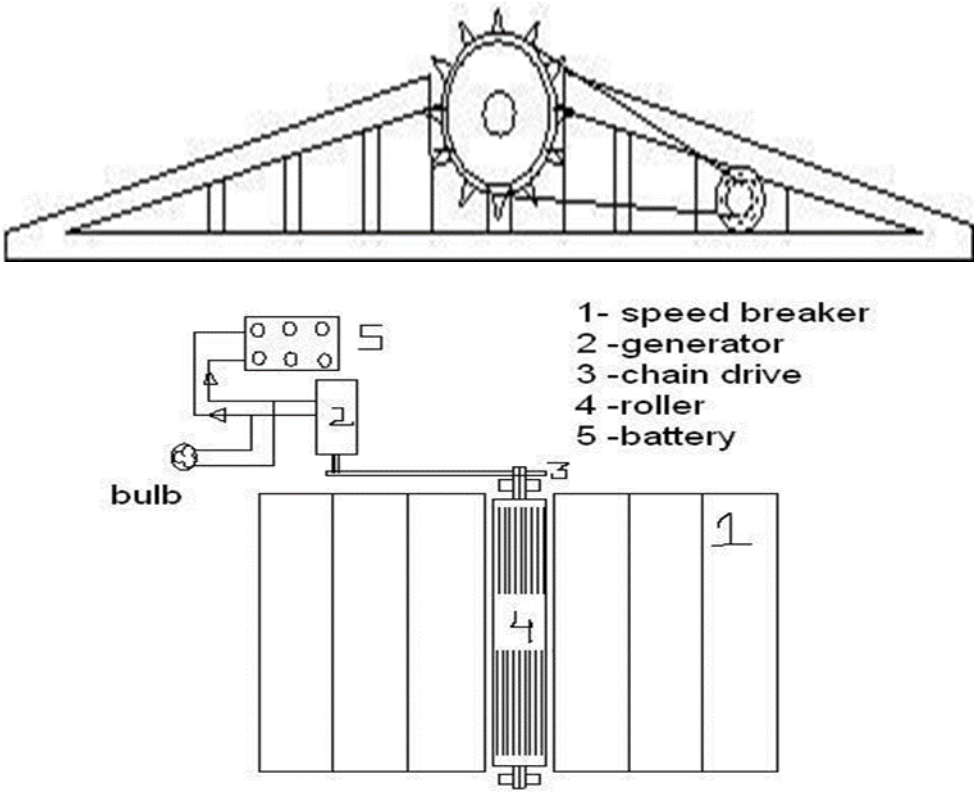

Fig. Side View and Top View of Roller Mechanism

In this Mechanism, a roller is fitted in between a speed breaker and some kind of 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 different speed ratios. 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 street lamps on the road. Now during daytime we don't need electricity for lightening the street lamps so we are using a control switch which is manually operated .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.

Disadvantages:

- Maintenance will be very difficult
- Might cause collision

Crankshaft Mechanism

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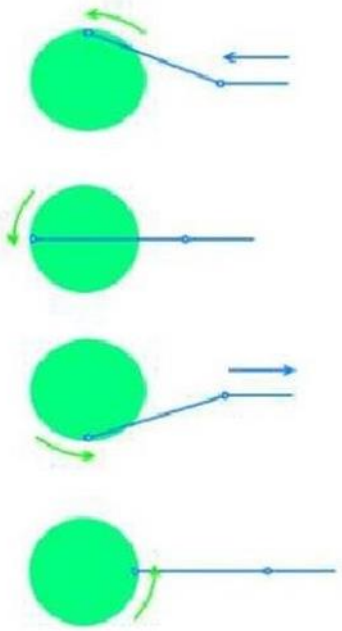

Fig Crankshaft Mechanism

The crankshaft is a mechanism that transforms rotary movement into linear movement, or vice versa. For example, the motion of the pistons in the engine of a car is linear (they go up and down). But the motion of the wheels has to be rotary. So, engineers put a crankshaft between the engine and the transmission to the wheels. The pistons of the engine move the crankshaft and the movement becomes rotary. Then the rotary movement goes past the clutch and the gear box all the way to the wheels. This mechanism changes the vertical translational motion of the speed breaker to a rotational motion through speed-breaker and crank-shaft connection. Therefore, the dynamo which is connected to a spur gear through a shaft is receiving the rotation, consequently, power is generated.

Disadvantages:

- Crank-shafts are required to be mounted on bearings which creates balancing problem
- Mechanical vibrations which in turn damage the bearings
- As bearings are of sliding type, any occurrence of variable load(which is bit obvious in case of vehicles) leads to balancing problem

Rack-Pinion Mechanism

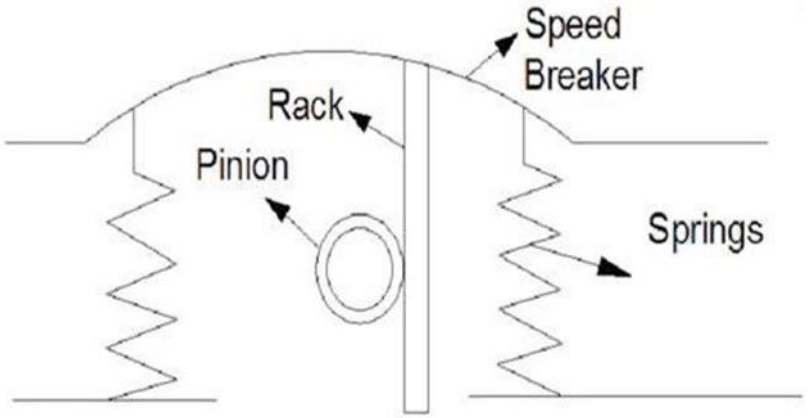

Fig Rack and pinion mechanism

While moving, the vehicles possess some Potential Energy due to its weight and it is being wasted. This kinetic energy can be utilized to produce power by using a special arrangement called POWER

HUMP. It is an Electro-Mechanical unit. It utilizes both mechanical technologies and electrical techniques for the power generation and its storage. POWER HUMP is a dome like device likely to be speed breaker.

Whenever the vehicle is allowed to pass over the dome it gets pressed downwards then the springs are attached to the dome and are compressed and the rack which is attached to the bottom of the dome moves downward in reciprocating motion. Since the rack has teeth connected to gears, there exists conversion of reciprocating motion of rack into rotary motion of gears but the two gears rotate in opposite direction. So that the shafts will rotate with certain R.P.M. these shafts are connected through a set of gears to the dynamos, which converts the mechanical energy into electrical energy. The conversion will be proportional to traffic density. The electrical output can be improved by arranging these POWER HUMPS in series. This generated power can be amplified and stored by using different electrical devices

Advantages:

- Rack-Pinion assembly gives good mounting convenience
- Maximum gear losses– 3 to 5%
- Approximate Efficiency– 95%

IV. WORKING PRINCIPLE

While moving, the vehicles possess some kinetic energy and it is being wasted. This kinetic energy can be utilized to produce power by using a special arrangement called POWER HUMP. It is an Electro-Mechanical unit. It utilizes both mechanical technologies and electrical techniques for the power generation and its storage. POWER HUMP is a dome like device likely to be speed breaker. Whenever the vehicle is allowed to pass over the dome it gets pressed downwards then the springs are attached to the dome is compressed and the rack which is attached to the bottom of the dome moves downward in reciprocating motion. Since the rack has teeth connected to gears, there exists conversion of reciprocating motion of rack into rotary motion of gears but the two gears rotate in opposite direction. A flywheel is mounted on the shaft whose function is to regulate the fluctuation in the energy and to make the energy uniform. So that the shafts will rotate with certain R.P.M. these shafts are connected through a belt drive to the dynamos, which converts the mechanical energy into electrical energy. The conversion will be proportional to traffic density.

Whenever an armature rotates between the magnetic fields of south and north poles, an E.M.F is induced in it. So, for inducing the e.m.f, armature coil has to rotate, for rotating this armature it is connected to a long shaft. By rotating same e.m.f is induced, for this rotation kinetic energy of moving vehicles is utilized. The power is generated in both the directions; to convert this power into one way, a special component is used called Zener diode for continuous supply. All this mechanism can be housed under the dome, like speed breaker, which is called HUMP. The electrical output can be improved by arranging these POWER HUMPS in series. This generated power can be amplified and stored by using different electrical devices. When the vehicle runs over the speed breaker, the vehicle usually lifts up by the maximum height of the speed breaker. If the speed breaker is free to move, the bump would be displaced vertically down, instead of vehicle moving up. The moving bump pushes the rack downwards. The rack, meshed with the sprocket switches the linear motion to rotary motion. This motion is transferred to the shaft of the sprocket. The sprocket that sits on the same shaft also rotates with the same shaft. This sprocket is in mesh with the sprocket through the chain. The chain drive rotates the second shaft. The gear on this second shaft rotates along with the shaft. This gear is in mesh with the gear. This gear sits on the generator shaft. Thus the generator shaft is driven by the whole mechanism with the motion of the bump.

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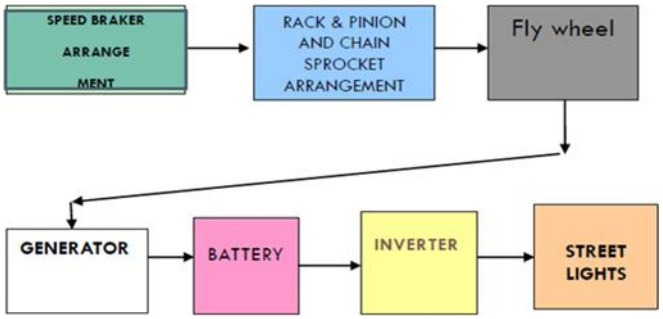

Fig Block diagram of the arrangement

Basic Outline of the System

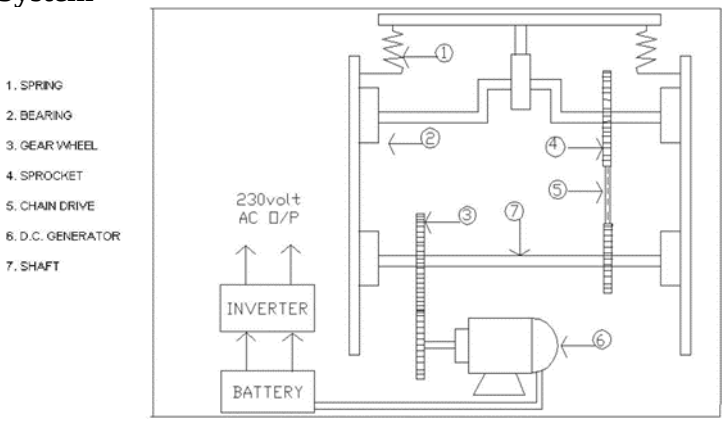

Fig Basic outline of the system

V. CONCLUSION AND FUTURE SCOPE

Speed-breaker power generator is a system that is capable of using the kinetic energy of vehicles and converting them into electrical energy. In this work, a prototype is constructed and an experimental study is performed. Nonetheless, it was revealed that powers of roughly 12.69 to 35.45 W can be generated from the speed-breaker system when masses of 116 kg and 246 kg are applied. Hence, a consequence average of 0.37W/kg forms a promising sign for the performance of such systems in real applications. Extrapolations to a real physical system indicate that a minimum average power of 0.56 kW can be generated for every passing vehicle. In other words installing a speed bump power generator on road will provide a power that may be utilized to lighten city streets, boulevards, and supply low-voltage powers to cameras or speed-sensors.

Future work would consist of a redesign of this model to see exactly how much data we may be missing with the assumption that we made with low price, weight and capacity. Despite all the assumptions, we still have realized that this product can be very marketable and that the demand is extremely large which means this is a viable design that will yield a high return on an investment. This mechanism is very economical and easy to install. Two protocols of this type of speed breakers are developed in India, not practically implemented till date. It was practically implemented in New Jersey, China and Indonesia. Lots of researches and investigations are going on to practically utilize this technique. Installing a speed bump power generator on road will provide a power that may be utilized to lighten city streets, boulevards, and supply low-voltage powers to cameras or speed-sensors. At door steps of every house the mechanism can be arranged. When a person steps on the door step the weight of the person drives the mechanism and initiates a trigger signal which closes the circuit that finishes an alarm. With small changes to the above application the device can be used as a surveillance alarm. When the person steps on the device, the alarm turns on. It can be stopped only by any personnel switching off the switch of the alarm at the security room.

- Such speed breakers can be designed for heavy vehicles, thus increasing input torque and ultimately output of generator.
- More suitable and compact mechanisms to enhance efficiency.
- Various government departments can take up an initiative to implement these power humps on a large scale.
- These can be mainly used at toll booths, approaching traffic signals, highways where vehicles move 24 x 7 etc.
- This has a huge scope everywhere provides the resources are channelled well.

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