AUTOMATIC CONTROL SIGNAL OPERATED ROAD BLOCKER BY USING ELECTRICITY FROM SPEED BREAKER

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ABSTRACT

Generally we observe on the traffic signal, people violet the rule of traffic signal and create a disturbance and daze at signal point which create traffic, causes accident. To overcome this problem we provided a road blocker, which stop the vehicle on respective path depend upon traffic signal and stop the violation of traffic signal rule. To minimize or control the speed of vehicles we provided speed breaker from this speed breaker we generate electricity by using mechanism .This generated electricity we can used for operating the road blocker, this road blocker are operated on timing sensor. Also we provide the voice recognizing sensor for emergency situation such as ambulance, government class one vehicles etc.

On road vehicles waste a tremendous amount of energy on speed breakers, where there is a necessity to provide speed breaker to control the speed of the vehicles. The annual rate of growth of motor vehicle population in India has been almost 20 percent during the last decade. There is tremendous vehicular growth in year by year. The increasing traffic and number of speed breakers on roads motivate to manufacture an innovative device which can channelize the energy of vehicles that is wasted on speed breakers to some useful work.

Keyword : - *Speed Breaker, Rack, Pinion, Dynamo, Signal etc….*

1. INTRODUCTION

Vehicular traffic at intersecting streets is typically controlled by traffic control lights. The function of traffic lights requires sophisticated control and coordination to ensure that traffic moves as smoothly and safely as possible. Again for safety purpose the way in which signal is being RED to mark the exact blocked through the signal as well as a series of rods with some height in the exchange of speed breaker and when GREEN opening the way to shut down the rods exchanging with speed breaker. Battery is use as

a source and charging of battery through the mechanism provided, to make the action depending upon the movement of vehicle .

Along with the Speed breaker, whereas the movement of up-down to rotate the shaft of alternator, battery get charge and it is available as a source to the system. In recent days electro-mechanical controllers are replaced by electronic circuits. The accuracy & fault tolerant drive towards electronic circuits. Also the provision of emergency calls like ambulance, fire brigade vehicles etc. By using sensor, along the way of emergency calls, traffic get blocked, availability is depending upon the priority call levels. This project is developed to meet the requirements of solid state traffic light controller by adopting microcontroller as the main controlling element, and led's as the indication of light. A micro controller is interfaced to LED's provide for centralized control of the traffic signals. Microcontroller is programmed in such a way to adjust their timing and phasing to meet changing traffic conditions. The circuit besides being reliable and compact is also cost effective.

On road vehicles waste a tremendous amount of energy on speed breakers, where there is a necessity to provide speed breaker to control the speed of the vehicles. The annual rate of growth of motor vehicle population in India has been almost 20 percent during the last decade. There is tremendous vehicular growth in year by year. The increasing traffic and number of speed breakers on roads motivate to manufacture an innovative device which can channelize the energy of vehicles that is wasted on speed breakers to some useful work. In this paper it is mainly focused on the principle of Potential Energy to Electrical Energy Conventional. 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. If h is the height above an arbitrarily assigned reference point, then Kinetic energy of an object is the extra energy which it possesses due to its motion. It is defined as the work needed to accelerate a body of a given mass from rest to its current velocity. Having gained this energy during its acceleration, the body maintains this kinetic energy unless its speed changes. Negative work of the same magnitude would be required to return the body to a state of rest from that velocity. In this paper it is explained the working of a mechanism to generate power by converting the potential energy generated by a vehicle going up on a speed breaker into kinetic energy. When the vehicle moves over the inclined plates, it gains height resulting in increase in potential energy, which is wasted in a conventional rumble strip. When the breaker comes down, it moves the breaker up and down. This in turn rotates a geared shaft loaded with recoil springs. The output of this shaft is coupled to a dynamo to convert kinetic energy into electricity. A vehicle weighing 1,000 kg going up a height of 10 cm on such a rumble strip produces approximately 0.98 kilowatt power.

2. WORKING PRINCIPLE

We are going to construct a working model of Power generating using rack and pinion arrangement. The working principle for this system is as follows
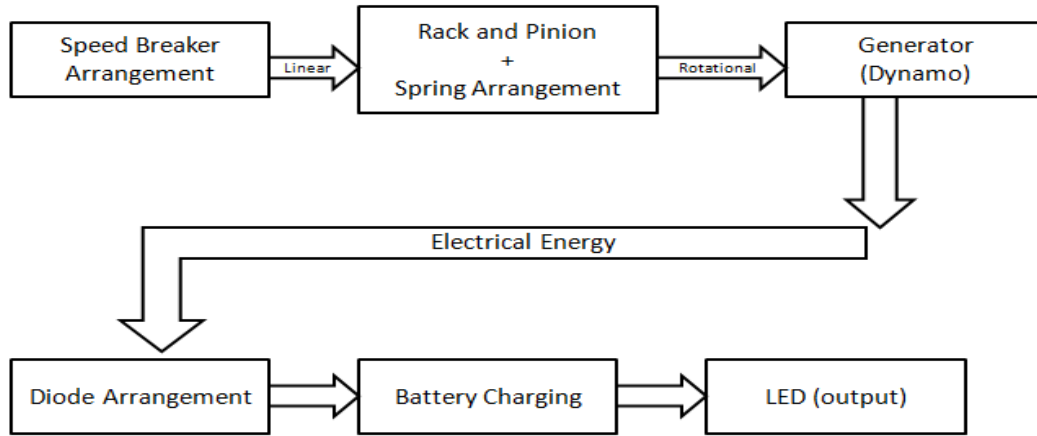
Block diagram 2.1

The complete diagram of the power generation using shock absorber is given below. The vehicle running time the shock absorber piston is moving up and down motion. This movement is converted to the electrical energy by using Rack and pinion arrangement. The rack & pinion is fixed at the shock absorber which is mounded bellow the L-angle window. The pinion shaft is connected to the supporter by end bearings as shown in fig. The larger sprocket also coupled with the pinion shaft, so that it is running the same speed of pinion. The larger sprocket is coupled to the small cycle sprocket with the help of chain (cycle). This larger sprocket is used to transfer the rotation force to the smaller sprocket. The smaller sprocket is running same direction for the forward and reverse direction of rotational movement of the larger sprocket. This action locks like a cycle pedaling action. The fly wheel and gear wheel is also coupled to the smaller sprocket shaft. The flywheel is used to increase the rpm of the smaller sprocket shaft. The gear wheel is coupled to the generator shaft with the help of another gear wheel. The generator is used here, is permanent magnet D.C generator. The generated voltage is 12Volt D.C. This D.C voltage is stored to the Lead-acid 12 Volt battery.
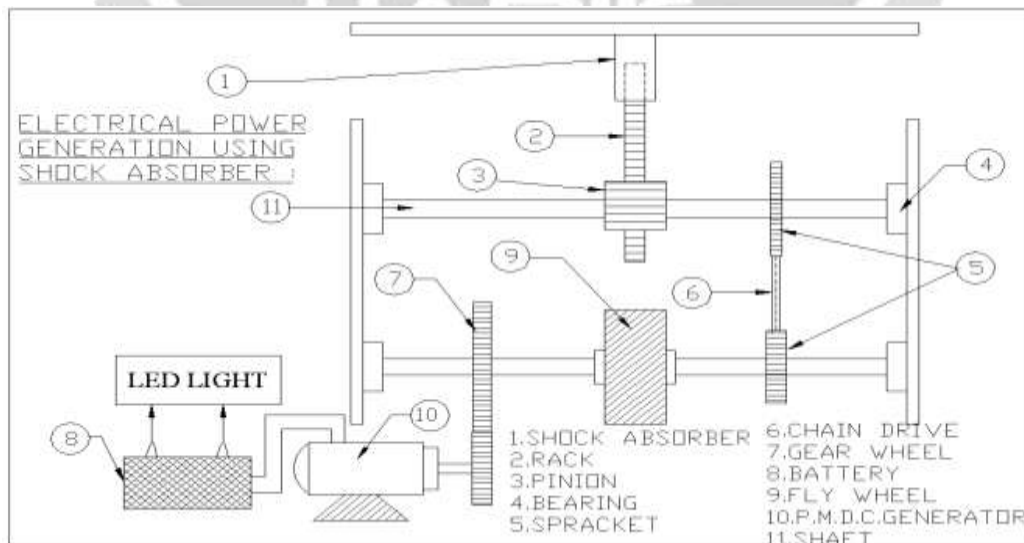
Block Diagram 2.2: Diagrammatic representation of the system (PGSA)

The battery is connected to the LED lights. 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.
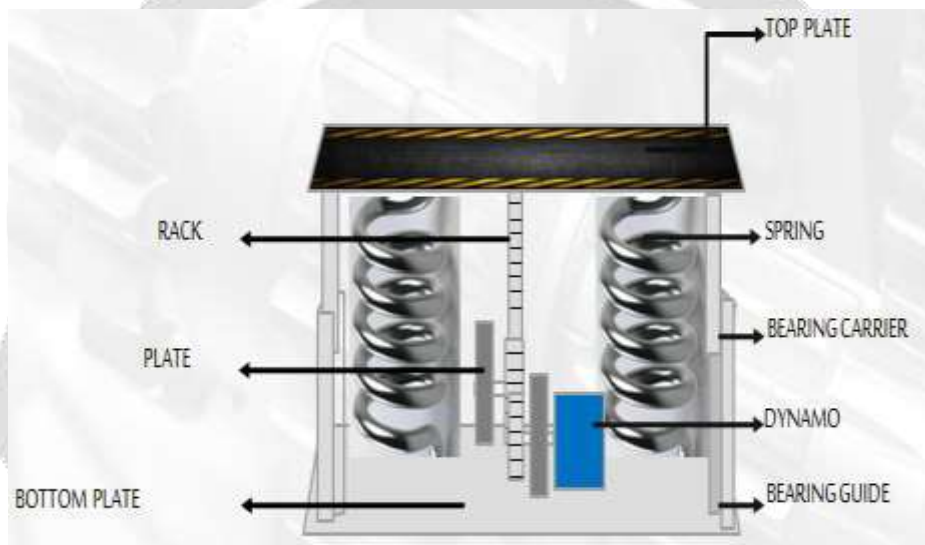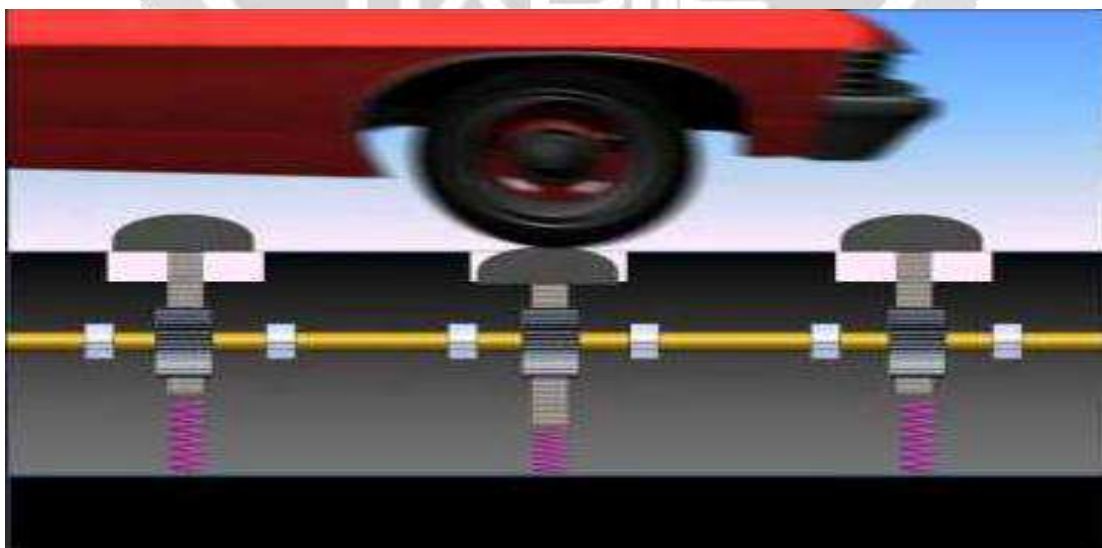

Fig.2.1 Rack and Pinion Mechanism

Fig.2.2 Animated demonstration of process

Motor Driver and Road blocking Mechanism:

For driving the D.C. motor, current through any port pins is not sufficient to drive it. So, we need and external driver to provide a sufficient current, (2) ULN2003 is use to drive the one D.C. motor. A series of rods with equal height is attached on the other flat side of segmented type speed breaker with equal distance, other end of rods are just above the tooth of D.C. motor shaft. Segmented type rigid speed breaker get rebalance through the spring action, which is attached below each segments. One D.C. motor is use to changing the orientation of roads with series of rods when road get block and open when segmented type speed breaker present. Other D.C. motor is used, Segmented type speed. Rigid strips through spring. Before changing the orientation of road way, we should moves the two strips horizontally aside with some distance to allow the movement of speed breaker into series of rod or segment type speed breaker on roadways.

Safely co-ordination between the signal and vehicle can be made possible by simply inserting the series of rods on the roadway to get blocked for some specified time i.e. signal RED and get open to change the orientation of the series of rods into segmented type speed breaker i.e. signal GREEN, these mechanism is controlled through the stepper motor .
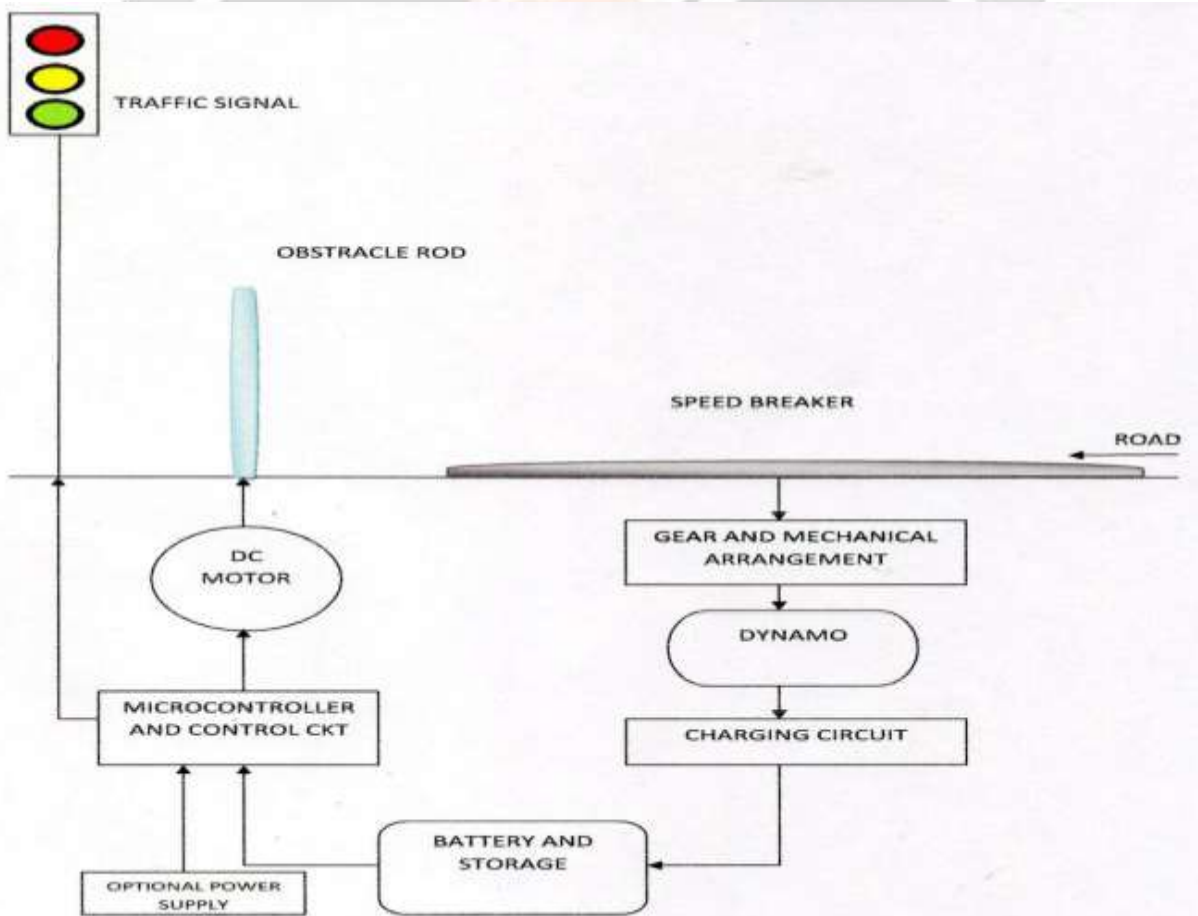
Block Dia.2.3 Automatic Generation Cum Traffic Control breaker base alien on the two

2.1 Construction

In This model we show that how we generate a voltage from the busy road traffic. In all the city's traffic is very much high and on some road, traffic move like a tortoise. This setup mainly consists 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 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 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.
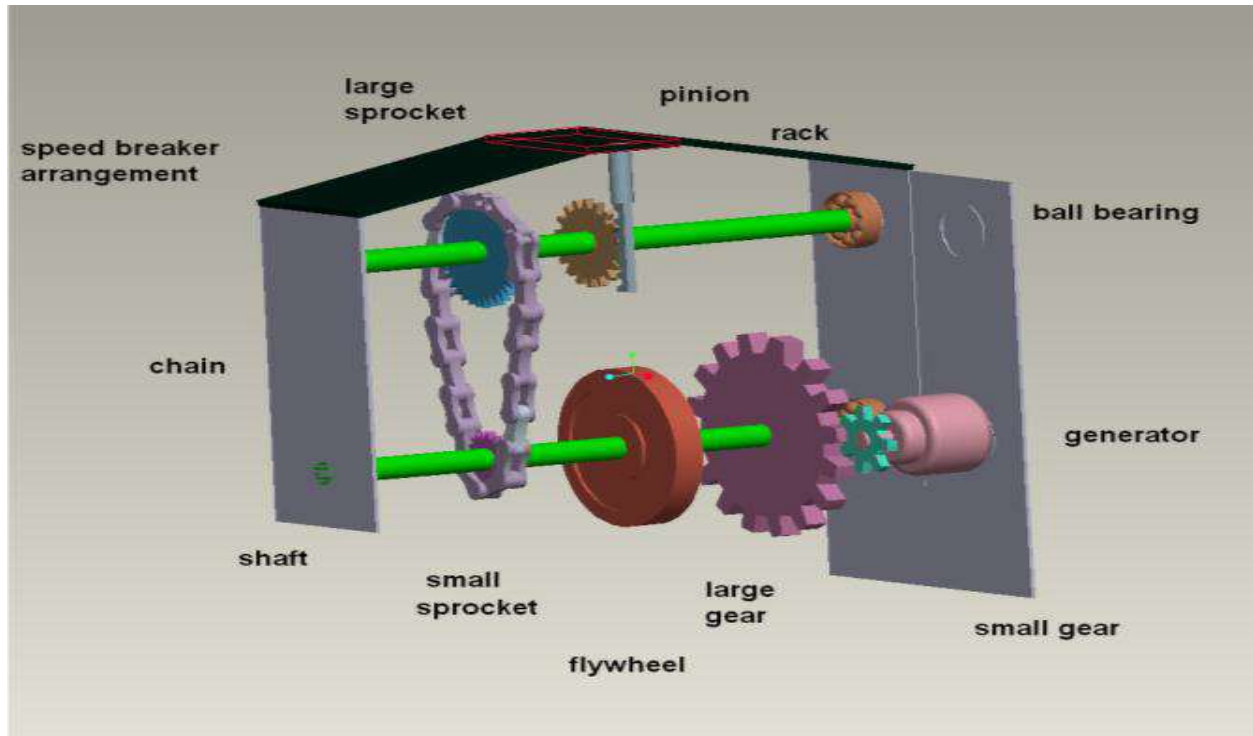

Fig.2.4 Project Model

Fig.2.5 Detail view of model

3. DIFFERENT COMPONENT OF MODEL

3.1. Rack and Pinion: - Generally Rack and Pinion are used to transfer linear motion into rotary motion. It is generally made up of cast iron. The rotary motion can also convert into linear motion.

Fig.3.1 Rack and Pinion

3.2 Shaft: - A shaft is a rotating machine element which is used to transmit the power from one place to another place. The power is delivered to shaft by some tangential force and resultant torque setup within the shaft permits the power to be transferred to various machine links up to the shaft. In order to transfer the power from one shaft to another shaft, the various members such as pulley, gears, etc. are mounted on it. This member along with the force exerted upon them causes the shaft to the bending.

Fig3.2 Shaft

3.3 Spring: - A spring is an elastic object used to store mechanical energy. Springs are usually made out of spring steel. There is large no. of spring designs; in every day uses the term often refers to coil springs. When spring is compressed from its resting position, it exerts an opposing force approximately proportional to its change in length.

Fig.3.3 spring

3.4 Pedestal Bearing: - A bearing is a machine element which supports another moving element. It permits relative motion between contact surfaces of the member, while caring the load. It consists of cast iron base gunmetal, or phosphorus bronze, or step made in two halve and cast iron cap. Sometime thin shims are introduced between cap and base to provide an adjustment for wear.

Fig.3.4 Pedestal Bearing

3.5 Chain: - Chain is used for transmit power from main sprocket to rear free wheel sprocket. In order to avoid sleeping, steel chains are used.

The chains are made up of no. of rigid links which are hinged together by pin joint in order to provide necessary flexibility for wrapping round the driving driven wheels.

Fig.3.5 Chain

3.6 Sprocket: - A sprocket is a toothed wheel upon which a chain rides. Contrary to popular opinion, a sprocket is not a gear. It is made up of steel.

Fig.3.6 Sprocket

3.7 Dynamo: - A dynamo is a electrical generator that produces direct current with the use of a commutator. Dynamos were the first electrical generator capable of delivering power for industry and the foundation upon which many other later electric power conversion device were based, including the electric motor, the alternating current alternator, and the rotary converter.

Fig.3.7 Dynamo

3.8 Battery: - A battery is a self-contained, chemical power pack that can produce a limited amount of electrical energy wherever it's needed. A battery slowly converts chemical packed inside it into electrical energy, typically released over a period of days, weeks, months, or even years.

Fig.3.8 Battery

3.9 Motors/Generator: - Electric motor involves rotating coils of wire which are driven by the magnetic force exerted by a magnetic field on an electric current. They transform electrical energy into mechanical energy.

Fig.3.9 Motors

3.10 Steel sheet: - Steel sheet is used for constructing the model. it is made up from steel. it is of thickness 2 mm. it's of 100 cm * 180 cm

Fig.3.10 Steel Sheet

3.11 Wire: - Wires are used to transfer the electrical energy produced by dynamo to the battery and it's also used to transfer the current from battery to the motor. Wires are of different thickness depending upon our application.

Fig.3.11 Wire

3.12 LED Bulbs: - The term LED means Light Emitting Diode, This LED bulbs are more efficient than the filament bulbs and tube lights. The Red, yellow and green bulbs are used in traffic signals to signify the stop, wait and go commands.

Fig.3.12 LED Bulbs

COMPONENTS LIST WITH THEIR SPECIFICATION:-

SR.NO	Name Of Component	Specification
1	Motor	1) Voltage = 12 2) Type = D.C. Generator 3) R.P.M =1200
2	Gear	1) Material =Mild Steel 2) No of teeth on rack = 40 3) No of teeth on pinion = 25
3	Spring	1) Load bearing capacity = 100kg 2) Material = Mild Steel 2) Total displacement = 2 inch
5	Bearing	1) Type = Rolling contact bearing
6	Shaft	1) Diameter = 15mm 2) Material = Mild Steel 3) Length = 100 cm

4. CALCULATION

Let us consider,

The mass of a vehicle moving over the speed breaker =250Kg (Approximately)

Height of speed brake =10 cm

Work done=Force x Distance

Here,

Force=Weight of the Body =250 Kg x 9.81 =2452.5 N

Distance traveled by the body = Height of the speed brake =10cm

Output power=Work done/Sec

= (2452.5 x 0.10)/60

=4.0875 Watts

(For One pushing force)

Power developed for 1 vehicle passing over the speed Breaker arrangement for one minute= 4.0875 watts

Power developed for 60 minutes (1 hr.) =245.25 watts Power developed for 24 hours=5.866 Kw

This is enough power to BATTERY CHARGE & ALSO PROVIDE ELECTRIC POWER TO SIGNAL on the roads.

D. Efficiency Calculation

Efficiency = [(Output Power/Input Power)*100] %

Efficiency = (2/14.55)*100% =13.75 %

4. CONCLUSIONS

The utilization of energy is an indication of the growth of a nation. One might conclude that to be materially rich and prosperous, a human being needs to consume more and more energy. And this paper is best source of energy that we get in day to day life.

Hence we have studied following conclusion.

1. Best solution to avoid accident and traffic at signal point.

2. Minimize traffic police efforts.

3. To provide electricity in villages near to highway, to fed power directly to   smart grid.

4. It can be placed in commercial building i.e. theatre, shopping mole, public/private parking etc. where use for.

5. The bearings can be replaced with more durable plumber bearings reducing the chance of failure.

6. REFERENCES

[1] The International Journal of Engineering and Science (IJES) ||Volume|| 2 ||Issue|| 11 ||Pages|| 25-27 ||2013|| ISSN (e): 2319 – 1813 ISSN (p): 2319 – 1805

[2] Amanpreet Kaur1, Shivansh Kumar Singh2, International Journal of Engineering Science and Innovative Technology (IJESIT) Volume 2, Issue 2, March 2013

[3] Aniket Mishra, Pratik Kale, Atul Kamble Department *of Mechanical Engineering, Bharati Vidyapeeth College of engineering*

[4] International Journal of Advances in Engineering & Technology, May, 2014. Piyush Bhagdikar, Shubham Gupta, VIT University Chennai Campus, Vandalur - Kelambakkam Road, Chennai 600127, India.0

[5]. Mukherjee Chakrabarti, 2005, Fundamentals of renewable energy systems,   New Age international limited publishers, New Delhi.

[6] Sharma.P.C, 2003, Non-conventional power plants, Public printing service, New Delhi.,

[7] R.D.Sharma, S.Jain, K.Singh, "Growth rate of motor vehicals in India", Journal of economics and social studies, Vol.I, 2011