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Electrical Power Generation by Roller Mechanism

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Abstract: ***Now a days the consumption of power has been increased tremendously. So in this project we are generating electrical power as nonconventional method by simply passing vehicles on to the specially designed roller setup. This research shows the possibility of tapping the wasted energy in the road rollers. Wasted energy can be converted to the electrical energy. This energy is sufficient to lighten the street lights and traffic signals. As the number of vehicle is increasing day by day the designed system will be effective to solve the power crisis.***
Keywords: Non-Conventional , Roller set up, Vehicles, Waste energy, Street Light.

I. INTRODUCTION

In todays world Power becomes major need for human life, There is need to develop non-renewable energy sources. So in this project we are going to introduce one of such method which is generation of electricity by using roller mechanism. This setup generates free electricity by simply passing a vehicles over it. The basic principle of this system is simply conversion of mechanical energy in to electrical energy. The system is made up of roller which rotates due to pressure exerted by vehicle passing over it. The wasted kinetic energy of the vehicle is converted in to electrical energy by roller mechanism through several energy conversion methods. The generated electricity is stored in battery and then used as per requirement. As the number of vehicle increases day by day, this system will be useful to solve the energy crisis problem.

II. COMPONENTS USED

A. Rollers

Rollers are made up of iron material. The shaft inside the roller is made from EN8 material. The strength is strong enough to bear the vehicle weight.

1) *Properties of EN8 Material :* EN8 is an unalloyed medium carbon steel with good tensile strength. It is normally supplied in cold drawn or as rolled. Tensile properties can vary but are usually between 500-800 N/mm2. EN8 is available from stock in bar and can be cut to your requirement.

Fig 2.1 Roller

B. Bearing

A bearing is a device to allow constrained relative motion between two or more parts, typically rotation or linear movement. Bearings may be classified broadly according to the motions they allow and according to their principle of operation as well as by the directions of applied loads they can handle. The type of bearing used here is rolling element type bearing which is widely used, relatively high friction, suffers from station in some applications. Depending upon the application, lifetime can be higher or lower than rolling element bearings.

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Fig.2.2 Bearing

C. DC Generator

An electrical generator is a device that converts mechanical energy to electrical energy, generally using electromagnetic induction. The source of mechanical energy may be a reciprocating or turbine steam engine, water falling through a turbine or waterwheel, an internal combustion engine, a wind turbine, a hand crank, or any other source of mechanical energy.

Fig.2.3 DC generator

D. Battery

A generated electrical energy is stored in the battery and can deliver to the load.

Fig.2.4 Battery

E. Pulley

Pulley units consist of round discs attached to thick, durable ropes. The larger pulley is known as driver pulley and the smaller pulley is known as driven pulley which are connected through belt. With the help of pulley ratio we can provide wide variety of driven speed.

Fig.2.5 Pulley

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III. BLOCK DIAGRAM

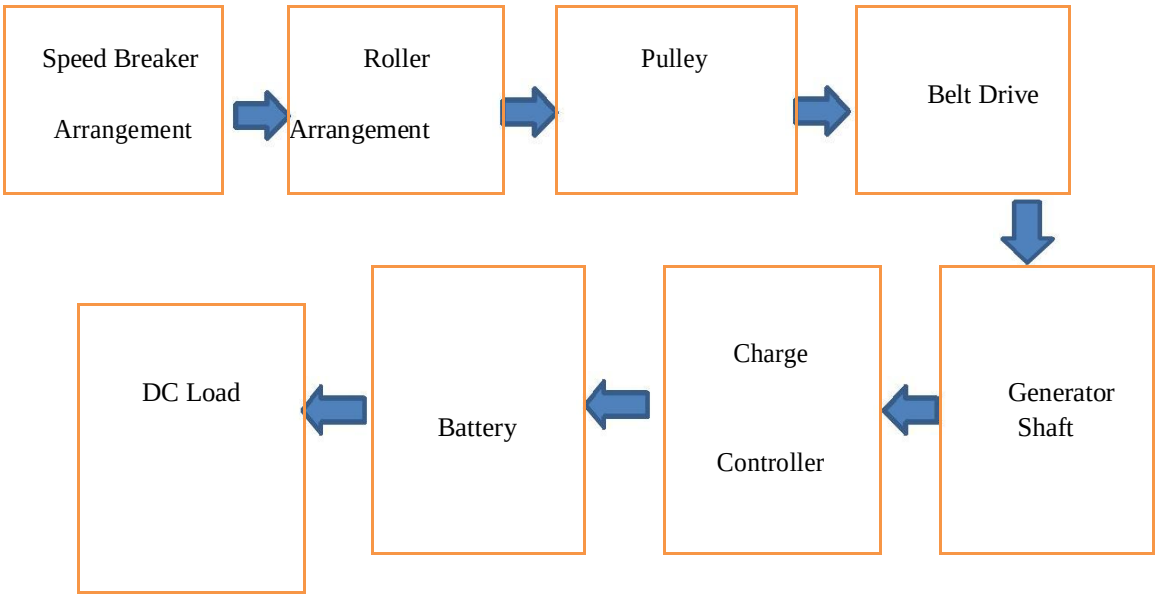

Fig. 3 Block diagram of the setup

The overall system is represented by block diagram as displayed in figure.3 In this system the roller acts as speed breaker by which dissipated power of vehicles is used to rotate the roller. Pulley system is used to increases the rotations. The generator is connected to roller shaft with the help of pulley. The generator convert mechanical energy into electrical energy. The produced electrical energy is stored in battery. Switch is used for ON\OFF purpose and load is connected to battery.

IV. SYSTEM IMPLIMENTATION

Fig.4:Roller Setup

A. Data Collection

The total implementation of research can be represented by several steps .At the first step, before vehicle passing across the roller there is no current flow and nearly zero voltage at the terminal. This shows no charging operation to the battery.

In the second step, vehicle has just passed on the roller, as a result a high torque induced in roller. Due to this high torque roller gives rotation. This rotation produces terminal voltage and causes charging current to flow towards battery. So battery charging with high terminal voltage. At that moment terminal voltage is 12V and charging current value is 0.9A.

In the third, step as the vehicle passes through the roller the rotation of the roller decreases which also decreases the terminal voltage to 9.5V. But the charging period continues to increases with higher current amplitude and gain a value of 1.5A.The decrease of terminal voltage is not similar to the increase rate of charging current.

In the final step rotation of the roller decreases which also decrease the terminal voltage to approximately zero volts. At the same

time, charging current amplitude also starts decreasing and becomes approximate zero.

B. Data Analysis

In this research, the experimental data is taken by using two-wheeler vehicle for different types of load(kg). Where loads are varied by changing the number of persons on vehicle. Variation of output with load is shown in figure. Where it is clear that terminal voltage and output power increase proportionally with the vehicle load.

Vehicle Load (kg)	Maximum generated voltage	Maximum generated current	Mean Power (watt)
200	10.5	0.62	6.51
225	11.6	0.75	8.7
260	12	0.9	10.8
305	12.5	0.95	11.86

Table1-Experimental data of the implementation

Speed(km/h)	Output voltage(V)	Output current(A)	Output power(w)
15	5.78	1.26	7.3
25	6.07	0.88	5.4
35	6.24	0.57	3.6

Table2-Experimental data of the implementation

C. Calculation Analysis

Mass of vehicle, M =250kg (approx.)
Height of roller above speed breaker=5cm
Mass of roller , m=7kg
Roller radius, r=30mm
No. of rotation per minute for roller=N1
No. of rotation per minute for generator=N2
Gear ratio= N1:N2=1:9
When vehicle passes over the speed breaker induced toque on roller, T=Force*Distance
=M*g*h
=250*9.81*0.05
=122.63Nm

Here N1=1.5RPM
N2=N1*9
=1.5*9
=13.5RPM

If 8 vehicles pass in one minute number of rotation of generator shaft,
N=8*13.5
=108RPM

D. Rating of Generator Used

Rated Voltage V=12V,
N0=150RPM
Current capacity=0.7Amp
Internal generated voltage EA ,
EA/EA0=N/N0

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Or, EA= (N*EA0)/N0
= (108*14)/150
= 10.08V
Armature current, IA=Load Ampere Hour (Ah)/60
=0.7/60
=0.01166A
Terminal voltage VT=EA-IARA
=10.08-0.01166*16
=9.89V
Output power=VT*IA
=9.89*0.01166
=0.1153Watt

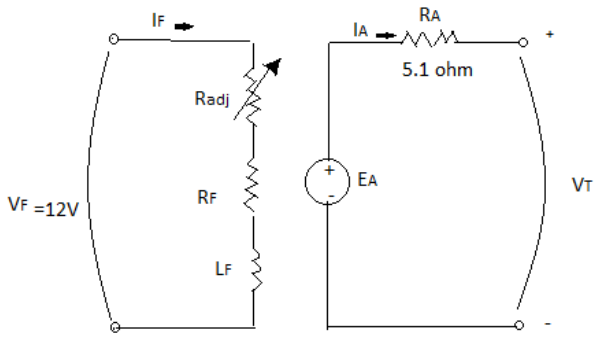

Fig.4 Internal diagram of DC generator

So one vehicle pass in 8Sec over the roller ,power generated=(0.1153*8*8)/60Watt
=0.1229Watt
Now for One hour (60mini)=0.1153*60
=6.93Watt
Power generated in one day(24Hr)=24*6.93
=1.664KW (For one Generator)
Total power generated in one day (by two generator)=3.32KW

E. Advantages

This system has several advantages as follows,

1) No fuel is required.
2) Energy is available all year.
3) Simple and easy construction .
4) Pollution free power generation.
5) No manual work necessary during generation.
6) No obstruction to traffic.
7) Low maintenance cost.

V. CONCLUSION

The growth of the nation is indicated by the utilisation of energy in that country. We need electricity for every small thing. So, this research is a small step to fulfil the requirement of increasing electricity demand and contributes something for the society. This project introduce a generation system for harnessing energy from speed breaker. It produces electrical energy proportional to traffic density which shows more possibility of collecting large amount of energy in busy cities. By adopting this arrangement, the load on

present electrical sources can be minimised to some extent.

VI. ACKNOWLEDGMENT

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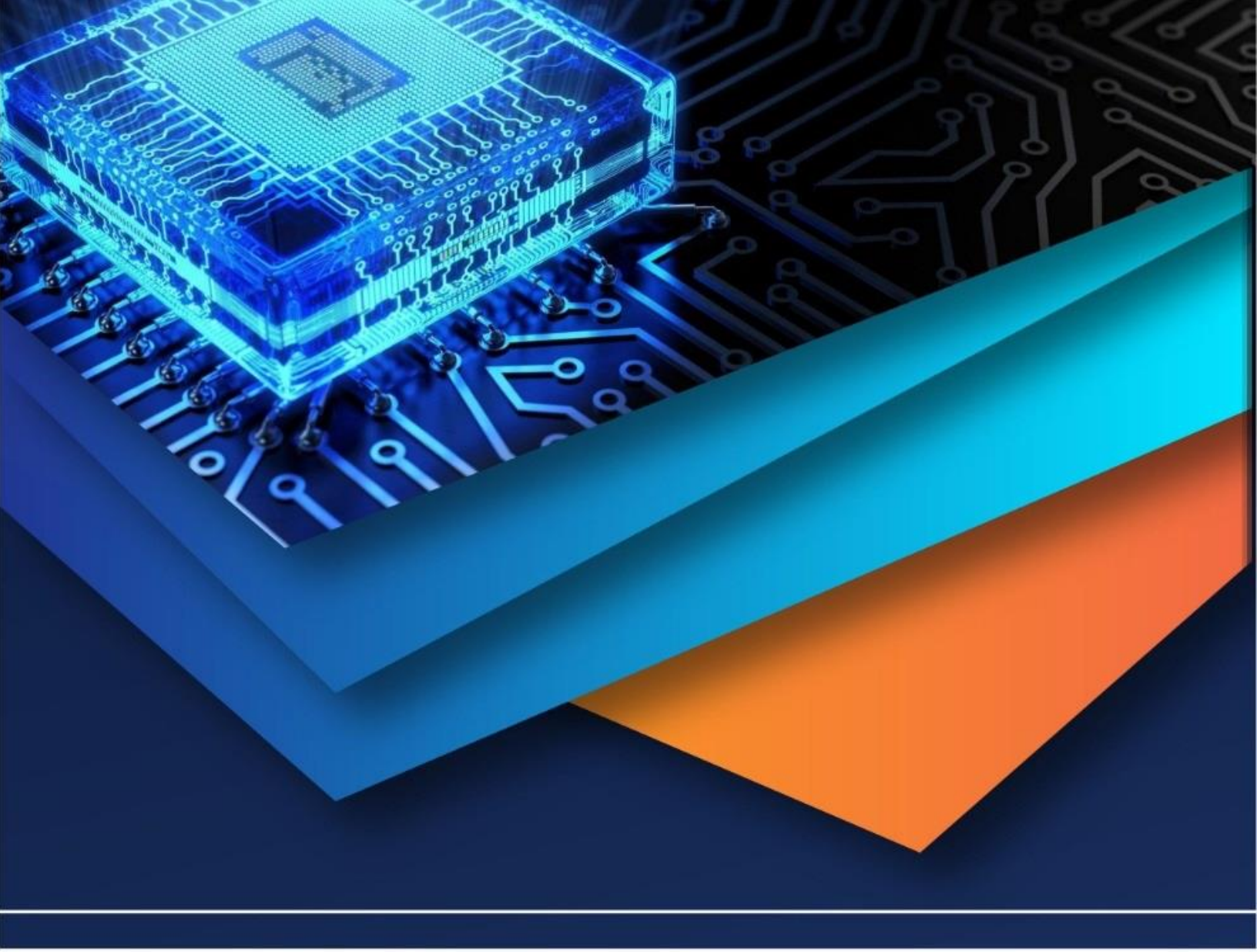

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