

Electric Power Generation Using Roller Mechanism

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Abstract--In this Project we are generating electrical power as non-conventional method by simply passing vehicles on to the specially designed Roller Setup. This method of Electrical power generation needs no input power. This Project is implemented by using simple drive mechanism such as Roller, some interfaced Electrical components and chain drive Mechanism. The basic principle is simple energy conversion form mechanical to electrical energy by using the vehicles weight (potential energy) & motion (kinetic energy).

I. INTRODUCTION

This road track generates free electricity as vehicles pass over and they are not like conventional speed bumps. They don't damage your car or waste petrol when you drive over them - and they have the added advantage that they produce energy free of charge. The Electro-Kinetic power generator is capable of generating around 10kW of electricity which can then be used to power road signs, traffic lights and street lights or stored in batteries for future use.

The track is made up of metal rollers that rotate by using the pressure exerted by vehicles passing over it. The movement of the rollers drives a specially developed design, which in turn drives a generator to produce electricity. The repeated rotations from the rollers, which is further attached to another free wheel allowing it to spin freely in-between while vehicles passes over the track.

II. HISTORY

The ramp was invented by Peter Hughes, in the year 2002 an electrical and mechanical engineer who is employed by Highway Energy Systems Ltd. The company says that under normal traffic conditions, the apparatus will produce 30 kW of electricity. Other proposed applications for the road ramps heating roads in the winter to prevent ice forming and ventilating tunnels to reduce pollution. "The full potential of this is absolutely enormous." Hughes claims that 10 ramps could generate the same power as one wind turbine.

III. THE ROLLER MECHANISM

In this project we replaced the ramps with the specially designed rollers which directly absorbs the kinetic energy of the moving vehicles and converts them to

rotational energy and thereby rotating the generator, to produce the electrical power.

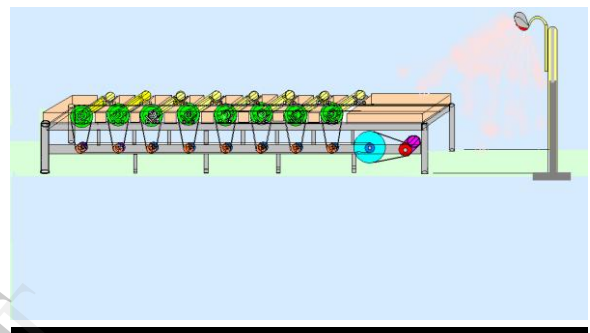


Figure: Design 1

IV. EQUIPMENT:

A. Rollers:

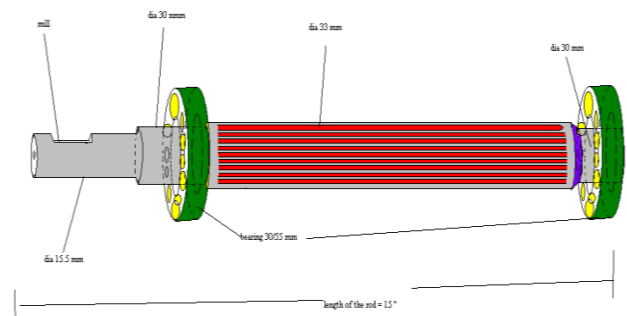


Figure 2

Material used: hardened EN8

Properties of EN8:

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 requirements.

Hardening:

To be heated uniformly to 830/860°C until heated through & Quench in oil or water. Can also be induction or flame hardened.

B. Bearings:

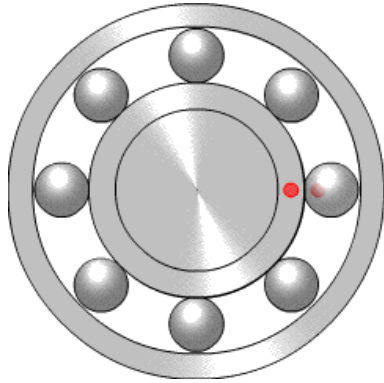


Figure: 3

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.

C. Free Wheels:

In mechanical or automotive engineering, a free wheel or overrunning clutch is a device in a transmission that disengages the driveshaft from the driven shaft when the driven shaft rotates faster than the driveshaft. An overdrive is sometimes mistakenly called a free wheel, but is otherwise unrelated.

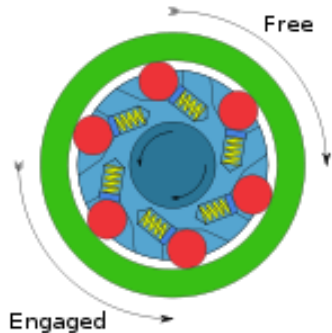


Figure: 4

The condition of a driven shaft spinning faster than its driveshaft exists in most bicycles when the rider holds his or her feet still, no longer pushing the pedals. In a fixed-gear bicycle, without a free wheel, the rear wheel would drive the pedals around.

An analogous condition exists in an automobile with a manual transmission going downhill or any situation where the driver takes his foot off the gas pedal, closing the throttle; the wheels want to drive the engine, possibly at a higher RPM. The simplest freewheel device consists of two saw-toothed, spring-loaded discs pressing against each other with the toothed sides together, somewhat like a ratchet. Rotating in

one direction, the saw teeth of the drive disc lock with the teeth of the driven disc, making it rotate at the same speed. If the drive disc slows down or stops rotating, the teeth of the driven disc slip over the drive disc teeth and continue rotating, producing a characteristic clicking sound proportionate to the speed difference of the driven gear relative to that of the (slower) driving gear.

4.4 Hubs:

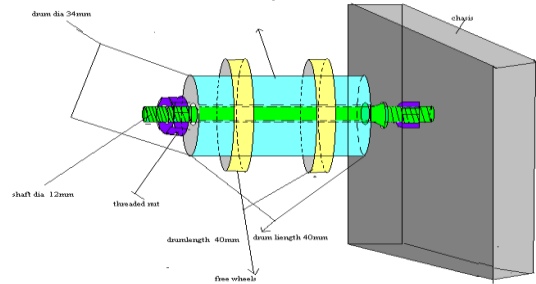
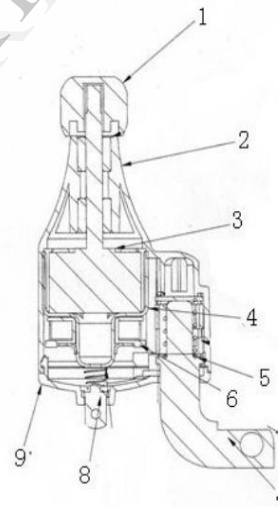


Figure: 5

These hubs are specially designed for holding the free wheels. Two free wheels will be seated on this hub. One the primary free wheel the chain from the rollers will be used whereas the secondary is used to transmit the energy to the alternator.

D. Generator (Dynamo):



1. Friction roller
2. The dynamo body
3. Magnetic steel
4. Winding support
5. Spring housing
6. Coil
7. Wrench
8. Lug plate
9. Rear cover

Figure: 6

The dynamo uses rotating coils of wire and magnetic fields to convert mechanical rotation into a pulsing direct electric current through Faraday's law of induction. A dynamo machine consists of a stationary structure, called the stator, which provides a constant magnetic field, and a set of rotating windings called the armature which turn within that field. The motion of the wire within the magnetic field causes the field to push on the electrons in the metal, creating an electric current in the wire. On small machines the constant magnetic field may be provided by one or more permanent magnets; larger machines have the constant magnetic field provided by one or more electromagnets, which are usually called field coils.

The commutator was needed to produce direct current. When a loop of wire rotates in a magnetic field, the potential induced in it reverses with each half turn, generating an alternating current. However, in the early days of electric experimentation, alternating current generally had no known use. The few uses for electricity, such as electroplating, used direct current provided by messy liquid batteries. Dynamos were invented as a replacement for batteries. The commutator is essentially a rotary switch. It consists of a set of contacts mounted on the machine's shaft, combined with graphite-block stationary contacts, called "brushes", because the earliest such fixed contacts were metal brushes. The commutator reverses the connection of the windings to the external circuit when the potential reverses, so instead of alternating current, a pulsing direct current is produced.

V. EXPECTED RESULTS:

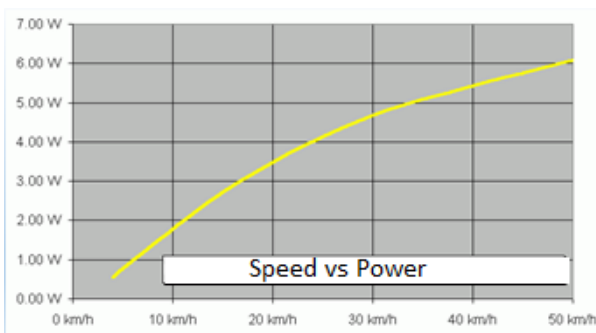


Figure: 7
Speed versus Power

1) Technical parameters

Output power test under constant voltage

Speed(km/h)	Output power(W)	Output volt(V)	Output current(A)
5	0.56	6.00	0.126
15	1.89	6.00	0.369
30	4.09	6.00	0.560

Constant-resistance load testing (18 ohms)

speed (km/h)	Output power(W)	Output volt(V)	Output current(A)
5	0.45	2.45	0.115
15	1.89	5.78	0.325
30	3.21	7.23	0.435

Temperature test :

Surroundings temp.	Shell temp.	Temp. rise	Remarks
20°C	55.2°C	32.2°C	keep 30cm distances test

When the vehicle moves on the roller setup we may get the results as shown in the graphs for the speed

No of dynamos used: 8
 Power of the dynamo: 3Watts
 RPM : 10/ dynamo
 Torque going to obtain : (HP X 5252)/N
 (0.004 * 5252)/ 10
 2.1 N-M
 Voltage going to Produce : 6Volts/dynamo
 Current going to produce : 0.5amps/dynamo

VI. CONCLUSION:

No one is happy with current situation of electricity in India We need electricity for every small thing. More suitable and compact mechanisms to enhance efficiency. Although we get less electrical output, this is a simple idea for generating electricity from kinetic energy of the moving vehicles. If this concept is further developed and is produced in high potential, I am confident that enormous amount of power can be developed. These rollers can be designed for heavy vehicles, thus increasing input torque and ultimately output of generator by using the multiple transmission system which is more efficient method

VII. REFERENCES

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