Design and Fabrication of Power Generation unit From Railway Track

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Abstract- In this project we are generating electrical power as non-conventional method by simply running train on the railway track. Non-conventional energy system is very essential at this time to our nation. Non-conventional energy using locomotive path needs no fuel input power to generate the output of the electrical power. The main aim of the concept is to utilize the train crossing time on a railway track. The power is produced by the railway track power generation equipment. Here the train flat is rubbing the roller held on the axle with the gear set which rotates the generator to generate electricity during the roller rolling. The roller will be rolling for the entire length of the train moving on it, and the energy generated will be stored in the battery and also showing the output by glowing a set of 10 LEDs. The stored energy is shown by glowing a set of street lights.

Keywords-Railway track, Gear arrangements , Power generation, Nonconventional.

1 INTRODUCTION

In the present day scenario power has become the major need for human life. Energy is an important input in all the sectors of any countries economy. The day-to-day increasing population and decreasing conventional sources for power generation, provides a need to think on non-conventional energy resources.

One of the systems in the world of transportation is Railways, which carries heavy loads next to shipping. The loads may be in the form of passengers or cargo. Railway becomes a biggest public transportation. Railways are always opting for passenger convenient systems and are developing various comforts and are devising easy operation for safety

The passenger division is the most preferred form of long distance transport in most of the country. A standard passenger train consists of eighteen coaches but some popular trains can have unto 24 coaches. Coaches are designed to accommodate anywhere from 18 to 72 passengers, but during the holiday seasons or when on busy routes, more passengers may travel in a coach. Most regular trains have coaches connected through vestibules.Herewe are looking forward to conserve the kinetic energy that gone wasted, while trains move. The number of trains passing over the system fixed on the railway track is increasing day by day. This paper attempts to show how energy can be tapped and used at a commonly used system- the rail track power generation. The number of trains passing over the track is increasing day by day. A large amount of energy is wasted at the railway track during the rolling of trains on the track, every time a vehicle passes over it. There is great possibility of tapping this energy and generating power by making the power generation system using gears, rollers etc.

2. METHODOLOGY AND WORKING

2.1 Objectives

- To design and fabricate the railway track mechanism on which the train assembly is moved by their wheels.
- To design and develop roller and gear arrangement which connect to generator through drive and driven gear to produce the electricity .
- To generate electricity to charge the battery, and simultaneously show the power generation during the movement of the train done manually will be rotating the generator at the high speed.

2.2 Methodology

- The principle of this project is "Conversion of mechanical energy in form of force into electrical energy" .
- In this project the train flat is rubbing the roller held on the axle with the gear set which rotates the generator to generate electricity.

- The energy generated is stored in the battery and can be used for the other requirements.
- We are making the track into two parts, one main track of length 2140mm and another additional track of length 1840mm, both are joined by bolts and nuts. The main track is fixed with the power generation unit comprising of gear assembly, roller, the drive and drive pulleys and generator. The train unit is made with the train engine and bogies being made in zinc steel sheet of 1.5mm thick with the requisite shape which are fixed on the tubular frame of width 130mm and length 1090mm. this train frame is fixed with the wheels being held on the axles and these axles are held within ball bearings and housings which are fixed.

- The wheels and the train roll on the track when pushed manually with very less effort.

2.3 Working

2.3.1 Block diagram

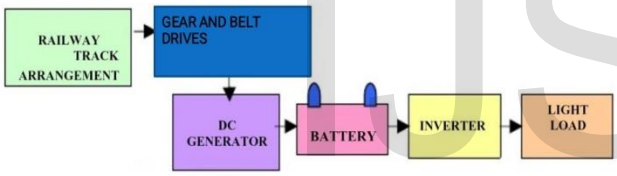

Fig 1. Block diagram

2.3.2 Circuit diagram

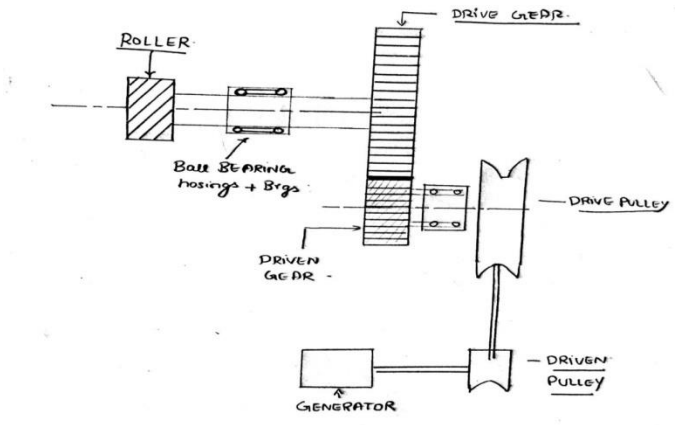

Fig 2. Circuit diagram

3 COMPONENTS

PARTS INVOLVED	SPECIFICATION	NO. OF SETS
1.Main Track	mild steel angle20x20x4mm	1
2.Additional track	mild steel angle 20x20x4mm	1
3.Battery holder	CRCA sheet 1.2mm thick	1
4.Gear Holding Plate	mild steel flat 40x6mm	2
5.Ball bearing housings	mild steel round dia 35x15mm	8
6.Ball bearings	standard---ID10/OD27/thk8m	8
7.Drive gear plug	mild steel round dia 50x12mm	1
8.Drive gear	C30 steel bought frm market	1
9.Driven gear	C30 steel bought frm market	1
10.Driven axle	C30 steel round dia 20x100mm	1
11.Drive axle	C30 steel round dia 20x120mm	1
12.Roller	mild steel round dia 75x15mm	1
13.Drive pulley	mild steel flat 20x3x120mm	1
14.Generator holder	standard	1
15.Generator	mild steel tube	1

	20x20mm	
16.Train frame	mild steel flat 20x5x95mm	1
17.Wheel axle support	mild steel flat 25x3x150mm	2
18.Leg for street light base	mild steel round dia 50x12mm	2
19.Wheels	C30 steel round dia 12x130mm	4
20.wheel axle	mild steel flat 25x3x920mm	2
21.Base for street light	mild steel flat 12x3x380mm	1
22.Street light poles	zinc steel sheet 1.5mm thick	5
23.Train engine cover	zinc steel sheet 1.5mm thick	1
24.Bogies cover	mild steel flat 25x5x900mm	2
25.Flat for pressing roller	standard	1
26.LED's set	standard	1
27.Battery	standard	1
28.LEDs for street light	standard	5
29.Wiring with switch	standard	2

4 DESIGN CALCULATION

4.1 Calculation of Gears rotations and pulley rotations

- The length of the flat plate = 925mm (92.5cm).
- Roller diameter = 35mm (3.5cm).
- Circumference of the roller (c) = 3.142×diameter of the roller
  = 3.142×35
  = 109.97mm (10.997cm).
- Rotation of the roller = circumference of the roller/length of the flat plate
  = 109.97mm/925mm
  = 8.41 rotations.
- Total number of teeth on driver gear = 53 teeth.
- Total number of teeth on driven gear= 12 teeth.
- Ratio of number of teeth = 53/12
  = 4.4
- Diameter of the driver pulley = 70mm (cm)
- Diameter of the driven pulley = 12mm (cm)
- Ratio of diameter of both the pulley's
  = 70mm/12mm
  = 5.833
- The total ratio will be = Ratio of no. of teeth of both the gears
  × Ratio of dia of both the pulleys.
  = 4.4×5.833
  = 25.65 Rotations
- The driving is by the roller of diameter 35 mm of which the circumference will be 109.97 mm, round off to 110 mm.
- The total length of the travel 925mm since that length flat is rubbing the roller, so the rotations we get for that travel will be = 925/110 = 8.40 rotations.
- The total rotations at the generator for the entire length travel will be
- = 25.65 x 8.40 = 215 rotations which will be generating electricity.
- Let us assume the travel time taken is three minutes for the entire train passing on the track now on this model, so the rpm will be = 215/3 = 72 rotations

4.2 Design for dynamo

- The emf induced in the armature of an alternator is given by,
- e = ZNØP/60 volts

Where,

Z = no. of conductors in series / phase.

N = Rotation of armature in revolution / min (rpm).

i.e. N/60 = rps

Ø = Flux produced per pole.

P = no. of poles.

According to specification of Dynamo ,

- No. of turns = 1000
- Winding material = Copper
- Winding = 4
- Z= 4 Conductors in series / phase

Assuming when,

- N = 44 rpm of magnet

= N/60 rps

Assume, Ø = 3.6 web/sec per pole, P=2 no of poles

Thus the emf induced in the armature of the alternator is given by,

e = ZNØP/60

= 2×44×3.6×2 / 60

e = 10.56 volts.

5 CONCLUSION

This generated electricity can be used for burning the street lights. it will save a lot of electricity of power plants that gets wasted in illuminating the street lights. As the conventional sources are depleting very fast, then it's time to think of alternatives.We got to save the power gained from the conventional sources for efficient use. So this idea provides an alternative. These days the railway traffic is increasing, we can utilize this for power generation by means of train track power generation. Now is the time to put forte these types of innovative ideas, and research on it to upgrade their implication.

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