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ELECTRICITY GENERATION THROUGH SPEED BREAKER

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Abstract

In the present scenario power becomes major need for human life. Due to day-to-day increase in population and lessen of the conventional sources, it becomes necessary that we must depend on non-conventional sources for power generation. While moving, the vehicles posses 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". The Kinetic energy of moving vehicles can be converted into mechanical energy of the shaft through crank shaft mechanism. This shaft is connected to the electric dynamo and it produces electrical energy proportional to traffic density. The generator voltage is 14 Volt D.C. This voltage either can be used to light up the LEDs or can be stored in the battery. Battery can be further connected to inverter to convert this 14 volt D.C. into 230 volt A.C.

Index Terms: *Flywheel, Gear Assembly, Dynamo etc.*

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1. INTRODUCTION

Energy is important in all the sectors of any country. Mainly energy crisis is due to two reasons viz. first is population of world has been increased and second reason is standard living of human being. Which causes lack of power. So by focusing this issue there is need of investigating other type of renewable source which produce electricity without using any type of non-renewable energy sources which may not cause harmful effect on the human being. In industry there is need of electrical energy to perform their function basically kinetic energy is used. To convert mechanical energy into electrical energy following methods can be used

- Rack and pinion mechanism
- Using gear box
- Crank shaft mechanism

2. WORKING

The kinetic energy of moving vehicles can be converted into the mechanical energy of the shaft though rack and pinion mechanism. But in rack and pinion mechanism electricity generated in one stroke and the other stroke wastes. When vehicles pass over the speed- breaker weight is applied on the speed breaker so rank and pinion shaft pushes downward. The shaft is wound on the gear and no energy is generated at downward direction. When pressure releases from the speed breaker at that time, spring mechanism pushes shaft upward direction and energy is generated by moves of gear box.

In this process of generation one direction stroke wastes. So we use the reverse crank shaft mechanism. In reverse crank shaft mechanism, electricity generated in both directions. There is no loss of kinetic energy in reverse crank shaft. We use the fly wheel that continuously rotates even after release of the applied pressure. Dynamo is used to convert the mechanical energy into the electrical energy.

3. DESIGN OF SPRING

The spring is mounted on a rack to make initial position of rack. The outer diameter of spring is restricted to 20mm Due to size of rack. The size of spring is selected so as to avoid jamming of spring.

D = 20 + clearance between spring & rack ….. (1)
= 20 + 2mm
D = 22 mm
We get wire diameter d = 5 mm from range
Calculating the load bearing capacity of spring index

$C = \frac{D}{d}$

$= \frac{22}{5}$

= 4.4 ….. (2)

C = 4.4

$K = \frac{4C-1}{4C-4} - \frac{0.614}{C}$ …. (3)

For C = 4.4K
= 1.08
We know

Type equation here.

$$\text{Shear stress} = \frac{8 K P D}{3.14\, d3} \quad \ldots. (4)$$

$$P = \frac{422 \times 3.14 \times 53}{8 \times 1.08 \times 22}$$

P = 870.74 N

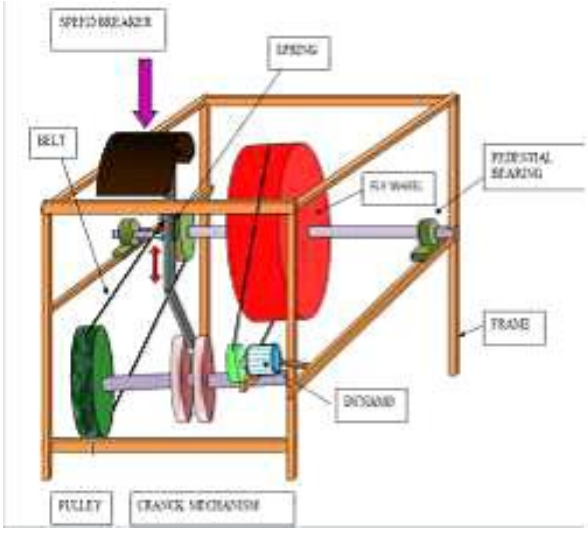

Fig-1: Working model

Applied load is limited to 300N.
So the design of spring is safe.
As we required deflection of spring in the range of 125 to 150 mm

Spring rate $= \frac{P}{\delta} = \frac{870.74}{150}$ = 5.8 N /mm

K = 5.8 N/mm
Calculation of number of turns of spring

We know

$$\delta = \frac{8PDo3N}{Gd4} \quad \ldots\ldots\ldots\ldots (5)$$

$$150 = \frac{8 \times 870.74 \times 223 \times N}{0.007845 \times 106 \times 54}$$

N = 10.68 Turns
N = 11 Turns
Solid length of spring Ls = N × d …..(6)
= 11 × 5
= 55 mm
Free length of spring = Ls + δ max + 0.015xδ …..(7)
= 55 + 150 + 0.15 × 150
Lf = 227.5 mm

$$\text{Pitch of spring} = \frac{\text{free length}}{N} \quad \ldots\ldots\ldots\ldots (8)$$

= Pitch = 20 mm

3. NAMES OF COMPONENTS USED AND SPECIFICTION:

Table-1: Component and specifications

s. no	Name of the component	quantity	specification
1	Shaft	2	(i)Diameter : 20mm (ii) Material : Mild steel
2	Helical spring	2	(i) Load bearing capacity :870N (ii)Material: Mild Steel
3	Bearing	2	(i) Type: P204 Pedestal bearing (ii) Spherical ball Bearing
4	Flywheel	1	Diameter 350 mm Width 80mm Filled with concrete Inside.
5	Belt and pulley	1	Belt Length 55.89 inch Dia of small pulley 100mm Dia of bigger pulley 250 mm Centre Distance between pulleys 310mm
6	Dynamo	1	PMDC 14 volts

4. ADVANTAGES

1) Easy for maintenance and no fuel transportation problem.
2) Pollution free power generation

3) No need of manpower during power generation.
4) Power generation with low cost.

5. CONCLUSION:-

By using additional spring and crank mechanism Maintenance and lubrication of rack and pinion is avoided. As rack and pinion is not used, its problem of loss of motion due to friction is avoided. This gives us better output voltage up to 14 volts approx.

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