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Real Time Mobile Battery Charging System by Human Walking

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Abstract: *Humans walk or run every day. We simply apply some force on the ground. So, why can't we generate energy from that? In the project, we use the shoe as a base material for charging the smart phone which is eco-friendly. Inside the shoe it contains rack and pinion mechanism. The rack attached to the bottom portion of the shoe in a vertical manner which rotates pinion attached to the dynamo for the production of electrical energy. The output voltage is made to store on the four 1.5v rechargeable battery which is connected in series. This method of recharging our smart phone in a smart way of using the energy resource from humans and can be used to charge at any time of the day.*

Keywords: *Eco-friendly, rechargeable, Rack and pinion mechanism.*

1. Introduction:

In this new era, there are so many technologies have been arising day to day. The primary focus of this project is to charge our, Mobile Phone etc when there is no power supply. Mobile phones are becoming a life essential nowadays. Think it off if one day we don't have any power source (which is non-renewable energy source) to charge. We know it's hard to all to think that moment. We want some renewable energy resource to charge our mobile phones. There have been some existing methods such as by using piezoelectric crystal, solar panels, wind energy, thermal energy and so on to charge our mobile phone battery. But, they can't avail at all time. So here we propose a new idea to charge our mobile battery in an eco-friendly manner.

1.1. Objectives:

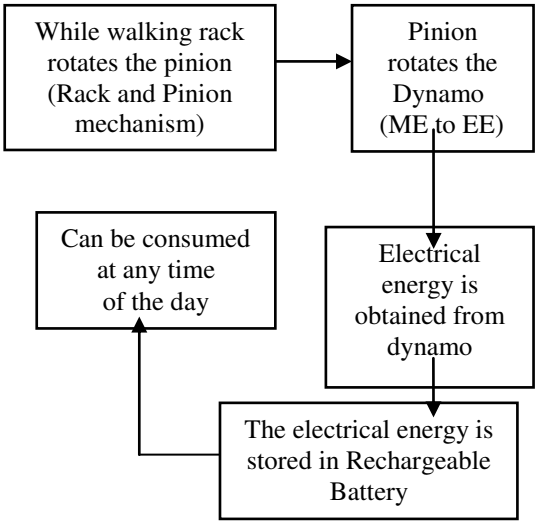
The main theme of this project is to design a mobile phone charging system with the following fulfillment

- Eco-friendly
- Helps to store charge
- Can be charged at any time of the day
- Does not need any power source

1.2. Main basic source

- Shoe
- Rack and pinion
- Gearbox with DC Motor
- Rechargeable battery

3. Flow of operation



4. Methodology

When we walk, the rack moves upward in which it has a 4 set of teeth that tends to rotate the pinion. Pinion has a helical type of gear with totally of 12 set. During reverse direction movement of the rack the pinion doesn't rotate. The centre of the pinion is hollow so thus it is made to attach to the shaft of the gear box. When pinion rotates, the shaft also rotates this tends to rotate the gear inside the box. Dynamo is fixed to gearbox will also rotate. A small movement of the gear will provide more rotation to the dynamo. More rotation of the motor will generate some voltage to charge our mobile phones

5. Experimental Work:

Gear box Specification:

White gear	**No of Teeth**	
Base	26	9
Top	36	13
Blue gear		

Base	36	9
Top	32	-

Table-1: Teeth setup

Rack Specification:
Height : 4.5cm
Thickness : 1st layer- 0.3cm
2nd layer- 0.4cm
No. of Teeth: 4

Pinion Specification:
Diameter : 1.2 cm
No. of teeth : 12
The pinion is made using 3D printing. The material used for the production is "**Acrylonitrile butadiene styrene"**

5. Electrical connection:

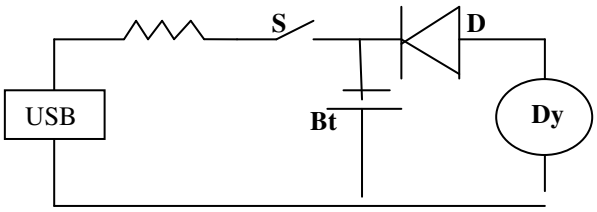


Figure-1 circuit connection

The obtained output voltage is made to store in the rechargable battery. The voltage is stored in battery and when switch is closed the electricity flows to voltage regulator where it regulates the voltage and is made to charge our battery via USB port

6. 3D Design:

Designed using CREO 3.0 PARAMETRIC Software

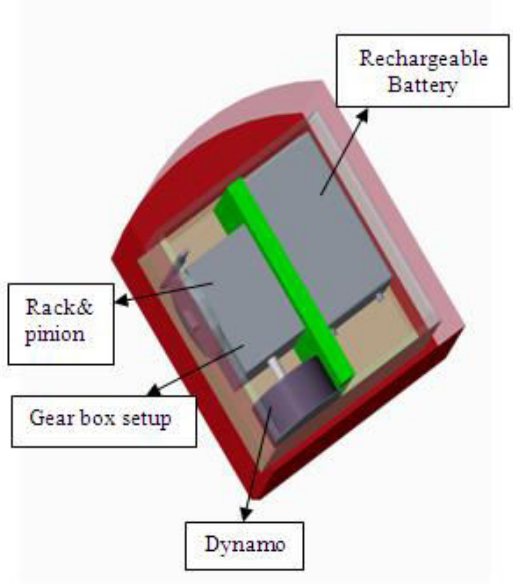


Figure-2: 3D design

7. Efficiency:

Efficiency= Output / Input
Output= Voltage * Current (0.5 Watt)
Input = Force * Velocity (0.011 Watt)
Force derived Hooks law equation:

$$F=K (L_{free} - L_{def})$$

L_{free} – Total Length of the spring
L_{def} - Deformed Length of the spring
K – Spring Constant

$$K= Gd^4/ [8nD^3]$$

G= Modulus of Rigidity (Stainless Steel 304)
d= Wire diameter
n= Number of Active Coil
D= Mean Diameter (Outer diameter- Inner diameter
G= 10000000psi
d= 0.039 inch
n=14
D= 0.31 inch
K=6.933
L_{free} – 1.45 inch
L_{def} - 1.33 inch
So, F= 3.77 N

Efficiency = 45.O4%

8. Cost Estimation:

SL.NO	COMPONENTS	COST(RS)
1	Dynamo with gearbox	80
2	1.2vRechargeable battery	430
3	Rack and pinion	40
4	Electrical components	50
5	Shoe	500
Total		**1100**

Table-2: Total cost of project (1 Unit)

9. Overview:

Figure-3: outlook

7. Pros and Cons:

-pros:

- Eco-friendly
- Portable
- Can be charged at any time without any power source
- Compact
- *Renewable*
- *Economical*

-cons:

- Wear of gear teeth will affect voltage production
- No water-proof

10. Unique selling point

- Economical
- Easy charging
- Efficient way of using our energy resource
- Safe
- Renewable

11. Closing statement:

In the closing remarks, we would like to say,

- This technique of charging helps us to use the renewable energy from human movement.
- One could consume electricity without worrying about power shutdown.

12. Acknowledgement

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