

Reoriented Prototype of Manual Power Exerciser cum Small Capacity Electric Generator for Charging Home Appliances at Interior Areas

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Abstract— In this research work a special type of “Modified Paddle Power Exerciser” was manufactured for producing electricity regarding fulfillment of energy or electricity crises and need in urban or village areas. The main motive of our research work is to lower down the energy production from conventional means and through this modified mechanism it will helpful to reduce the dependency on the fossil fuel for electricity generation, which are found in nature in very limited amount.

In simple language, our main objective is to decrease the dependency on the conventional energy or fuel resources because these resources and plants who utilize such resources are responsible for pollution and so now it is require to utilize the unconventional methods regarding electricity generation for fulfill the energy or electricity demand in urban or village areas, which does not effects the environment. The need for a modified electricity generation method is rising now days just because of many cases like, for reducing pollution rate, people travel short distance and medium distance (5-10 km) through cycles as major mode of transport in village areas due to money issue and also use bicycles for losing their weight, shaping their body through gym equipments in modern areas because they all are health conscious, they generally waste their all useful human effort while doing day to day work for handling manual agriculture equipments.

In present scenario public interest in physical fitness, while focusing such crucial points, today it is require that a special purpose modified paddle power electricity generator machine will develop which simultaneously utilizing there waste human effort while doing any manual work and directly converted there waste efforts into energy with the help of the rotating mechanism. This useful waste human effort which generally wasted during their day to day manual working and operating manual machine, now positively usable in charging cell phone and batteries, i-pot, tablet, laptops and home appliances etc.

Keywords— Pedal Power, Compound gear train, Alternator, Man Effort

I. INTRODUCTION

It is well known that the supplies of conventional fuels are limited and their utilization as energy resource in urban and village areas are major issue due to transportation of fuel in uneven geographical reason, in addition to this as the world population increase the requirements for such resources of energy increases, so the major issue arises and need for the steady replacement of such fuels and renewable resources will occur, which is also a crucial point of consideration for a lot of countries. Generally society used varying fuels like petrol, diesel, and coal etc, which are limited for generation of electricity from such resources are costly, that's why renewable power generation system is presently preferred for clean power production on the other hand these resources are non continuous in nature also, their initial cost is too high and hence, not able to satisfy the right quantity of energy demand which lead to energy crises in future. Now it is require to finding an alternative for such problems, with ongoing revolution in this present generation, electricity is produced at small level by using pedal power bicycle.

Cycles are the major means of transportation for many Indian villagers and most of these village areas are un-electrified. In present scenario public interest in physical fitness, while focusing such crucial points, today it is require that a special purpose modified paddle power electricity generator machine will develop which simultaneously utilizing there waste human effort while doing any manual work and directly converted there waste efforts into energy with the help of the rotating mechanism, which is also beneficial point for health and an effective solution for satisfy the demand of energy crises in village areas.

II. PROBLEM STATEMENT

When disasters and crises of electricity happens, human cut off from real world due to continuous use of advance devices like cell phone, I phone, at that time this machine comes into play through human effort and generate feasible quantity of electricity for charging batteries, phone, so that humans may connected to the main world again.

Our primary problem is to develop a feasible and cost free method which will helpful to run a particular Alternator and Dynamo as a generator to keep electricity production costs low and charge a battery which will capable of powering lights and a music amplifier and all other house hold electric devices like television, radio etc for about 8-15 hours in urban or village area which satisfy the demand of energy crises by utilizing the human effort without impacting the environment.

A. Need of Present Study

It is required to make a special purpose mechanism which will more reliable and cheap, which will helpful to find the potential, alignment angles, number of gears so that output rpm would be maximum with minimum input rpm deliver through man effort. Achieving feasible amount of support from above required mechanism it will necessary to select suitable flywheel so that it would be supportive to the operators during its working condition and also it could be modified in the easiest way to get the maximum output during negative loop, when man effort is not provided this flywheel comes into action.

B. Research objective

The main objective of making this research project was to develop a multipurpose machine set up which produces good amount of free electricity for GIM room and which will also applicable in urban or village area which fulfill the demand of energy crises by utilizing man effort. The major objectives of this research project are as follows:

- 1- To determine the optimum design specification of each elements of machine set-up.
- 2- To determine the optimum current and voltage to fulfill the demand of energy for various village home appliances from machine set-up.

III. MATERIAL AND METHODOLOGY

A. Compound Gear Assembly for Power Transmission

Gear trains, belt drive and chain drive are used as the power transmission elements. Here, chain drives are used in power transmission. The major components of the chain drives are sprocket and chains.

B. Adjustable gear mechanism

The main focus through this gear mechanism and assembly is to convert the one rotation provide through man effort into several rotation like 18 revolution at the last gear which is attached to the alternator which further generate electricity only through high rpm.

C. Flywheel:

Flywheel is a device which acts as a mechanical energy reservoir which stored energy high energy loop from the system and transmit energy to system when system need extra energy for maintaining constant speed.

D. Location of input and output gear and pulley

Waste human effort provided by human for running the system is delivered at input chain gear socket, this effort converted into rotation with the help of chain and gear socket whose end socket is connected to center shaft and further this rotational mechanical power passes from the center shaft where flywheel and larger pulley is placed which convert the received input rpm into high rpm through compound gear and belt pulley mechanism. Here, flywheel is use to store extra quantity of mechanical energy and large pulley and smaller alternator pulley diameter ratio is use to convert smaller rpm to high rpm. After that the high rpm received at alternator pulley generate feasible amount of electricity through alternator.

E. Alternator

Alternator is a device which is used to convert the rotation mechanical power into electricity through rpm which reaches to alternator pulley from the mechanical system. The principle working of this device based on faraday's law of electromagnetic induction.

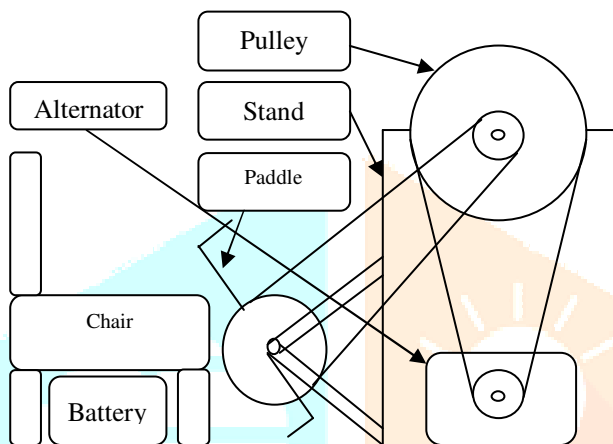


Figure1: Modified Paddle Power Electricity Generator Machine Set-up.

The above design and geometrical specification of parametric values of diameter and rpm for evaluating the optimum rpm at the output pulley which is connected to the alternator, so that we generate require amount of electricity, which is influence by effective rpm, regarding fulfill the demand of energy crises by utilizing man effort during exercise in urban or village area is based on empirical formula of compound gear train and schematic diagram of paddle power electricity generator machine set-up with design specifications is mention in equation number 1 and figure number 2.

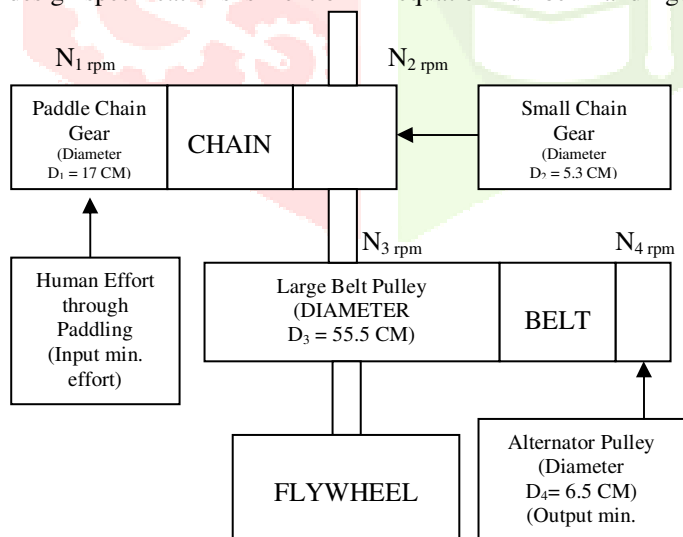


Figure 2: Schematic Diagram of Paddle Power Electricity Generator Machine Set-up with Design Specifications.

$$N_4/N_1 = D_1/D_2 \times D_3/D_4 \quad (1)$$

Here,

N_4 = Output RPM at Alternator Pulley

N_1 = Input RPM at Paddle Chain Gear

D_1 = Output Diameter of Paddle Chain Gear
 D_2 = Output RPM of Small Chain Gear
 D_3 = Output RPM of Large Chain Gear
 D_4 = Output Diameter of Alternator Pulley



Figure 3: Side View of Experimental Set-Up



Figure 4: Top View of Experimental Set-Up

IV. EXPECTED RESULT

The initial aim goal is to make a simple design so that construction and fabrication could be done in easy and cheap way. We were successfully able to design a paddle power electricity generator machine. This machine capacity is to generate 12-18 V electricity during normal power delivery through man effort during exercising and generate 5-10V during relaxing position of human through flywheel which is introduced between the centers of shaft, which is depend on the selection of diameter of large belt pulley, whose design specification in figure 2. The introduction of flywheel generates 8-10V electricity through the concept of moment of inertia during negative loop. Though, this voltage will further use for glow 8, 12volt bulbs, Charging i-phones, cell phones and bike batteries and other home appliances etc.

V. RESULT AND DISCUSSION

After fabrication of machine set up, three different human efforts provide to the machine, which was categorized as low, medium and high human effort. Now, the reading of different parameters such as rpm, voltage and current were evaluated. Voltage and current was measured through multimeter device at the end side of alternator and the reading of rpm was determined by tachometer device at the center part pulley of alternator.

Firstly, three different efforts were provided and with the help of multimeter varying voltage has been calculated with three different rpm, during low effort rpm range between 60 to 80 with voltage range 4.5 to 5V, medium effort rpm range between 400 to 800 with voltage range 7.5 to 10V and during high effort rpm range between 400 to 800 with voltage range 12.5 to 15V were determined.

Secondly, three different efforts were provided and with the help of multimeter varying current has been calculated with three different rpm, during low effort rpm range between 60 to 80 with voltage range 300 to 334 mA, medium effort rpm range between 400 to 800 with voltage range 456 to 587 mA and during high effort rpm range between 400 to 800 with voltage range 857 to 1340 mA were determined.

The optimum results of medium human effort were demonstrated through graphical representation below between rpm verses current and rpm verses voltage.

After evaluation of all readings between rpm, current and voltage it was clear that as the rpm will increase the current and voltage will also increase.

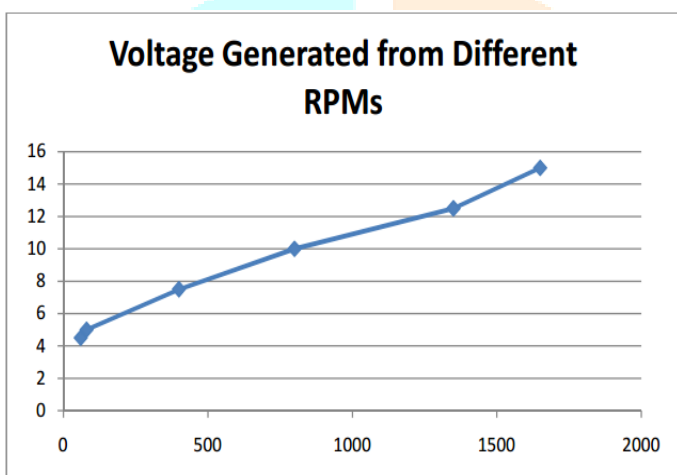


Figure 3: Voltage Output Based on Wheel Speed

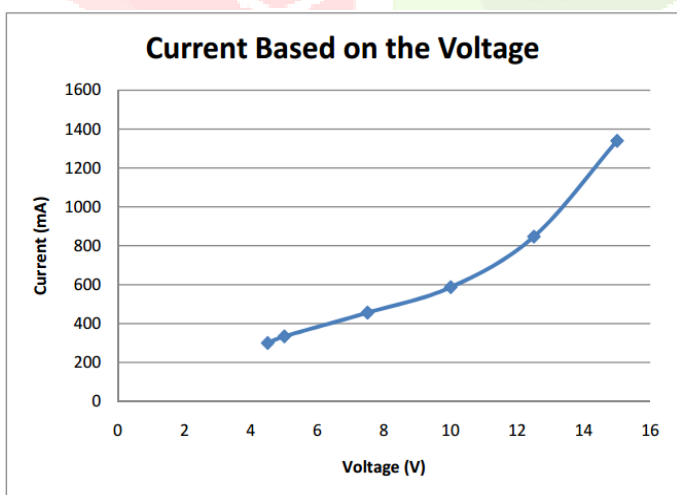


Figure 4: Current Based on Voltage from the Generator

So, after considering all results and human comfort, medium effort plays an important role for the practical implementation of such machine set up in urban or village area which fulfills the demand of energy crises by utilizing man effort during exercise and physical practice.

Table 1: RPMs at Different Voltages

RPMs of Rear Tire	Voltage
60	4.5
80	5
400	7.5
800	10
1350	12.5
1650	15

Table 2: Current Based on Voltage

Voltage	Current (mA)
4.5	300
5	334
7.5	456
10	587
12.5	847
15	1340

VI. CONCLUSION

The purpose of making such research project was to develop a multipurpose good amount of electricity for making free electricity room like GIM and which will also applicable in urban or village area which fulfill the demand of energy crises by utilizing man effort during exercise. When disasters and crises of electricity happens, human cut off from real world due to continuous use of advance devices like cell phone, I phone, at that time this machine will comes into participation by utilizing human effort and generate feasible amount of electricity for charging batteries, phone, so that humans may connected to the real world again.

After evaluation of all readings between rpm, current and voltage from machine set-up, it was clear that as the rpm will increase the current and voltage will also increase. So, after considering all results and human comfort, medium effort plays an important role for the practical implementation of such machine set up in urban or village area which fulfills the demand of energy crises by utilizing man effort during exercise and physical practice. The large diameter pulley is a major and depending factor for generating effective quantity of current and voltage which supports the need of require amount of energy for the village home appliances like, bulbs, CFLs, televisions, transistors, fan, batteries etc.

In this present research project report an energy scavenging system (flywheel) made of bigger rim built with recycled and independent components and targeted at the energy consumed while exercising was presented. Solutions for these problems were presented and a working prototype of the system was created and tested in real working conditions.

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