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Pedal Power Generation

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Abstract

One of the most useful forms of conventional energy is the pedal power generator. Bicycles can be converted into pedal generators that are simpler, cheaper and more environmentally friendly than other conventional methods. Not only are pedal generators cheap and easy to build, our experimentation and research reveals that pedal generators are capable of quickly charging batteries. The pedal generator battery charger promises to benefit power requirement applications across the world and meet the remote power requirements with simplicity.

Keywords: Battery, charge controller, exciter, generator.

Introduction

The most evident problem faced in our country is load shedding .It is due to insufficient power demand fulfillment. In urban areas and cities; however it is being compensated to some extent by alternate power resources such as inverters, UPS etc and, meets the power requirements of daily routines. It is the major problem when we consider the rural areas and villages. India is considered to be the land of villages, and if we don't consider the problems faced by villages due to load shedding, the whole country cannot achieve progress. As engineers if we try to, at least meet the domestic power requirements of the villages, it could be of great help towards progress of the villages. Government schemes such as night schools for empowering villagers could be of no use if their won't be power supply during nights.

Now coming to another major problem faced by the urban people is obesity due to lack of exercise, as engineers if we design a system to shoot out obesity problems and provide techniques to extract this additional energy as an alternate source of energy

for small power requirements together, it could be very efficient one to keep people healthier. So, we have come up with a solution to these problems as “Pedal generator battery charger”.

Project Conceptualization

A. Design Process

The most promising idea we came upon was that of the pedal generator. Using a person’s legs for generating electricity has many advantages over using a person’s arms.

Requirement

Simple enough to be constructed and maintained on-site by locally available tools.

Materials

Made up of simple materials and components that can be fortuitously substituted with one’s locally available.

Ease of use

User-friendly, allowing the user to start and stop charging whenever they please, without loss in efficiency and battery life span.

Versatility

Most suitable to all type of bikes.

B. Simplicity

One of the major advantages of our pedal generator battery charging technology is its simplicity. Bicycles are a popular form of recreation common to almost every village in the country, and can be operated by children and adults alike. Furthermore, the simple pedal generator design is likely to suffer from fewer mechanical failures than more sophisticated charging technologies that are often prone to electrical and mechanical failures. Unlike other battery-charging technologies, such as solar chargers, the pedal generator also does not require any specialized technical knowledge for operation and maintenance.

C. Ease in Mobility

Considering different terrain such as mountains, rivers, railway embankment, and urban areas. Our pedal generator is relatively compact and can be used to traverse harsh terrains. This can provide an overwhelming advantage to villagers and for urban people to install it at their convenient places.

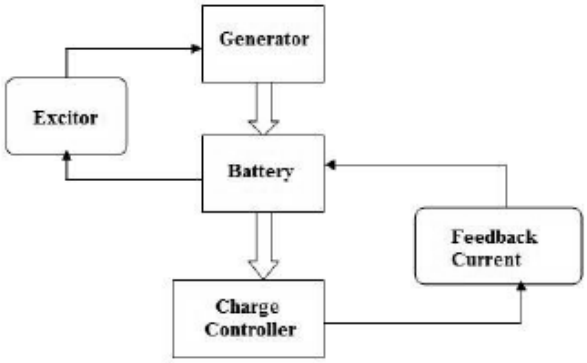
D. Reduced Environmental Impact

The proposed pedal generator eliminates the environmental consequences associated with most power sources and charging devices. First, the use of rechargeable batteries will reduce the hazardous waste that is created when disposing alkaline batteries used

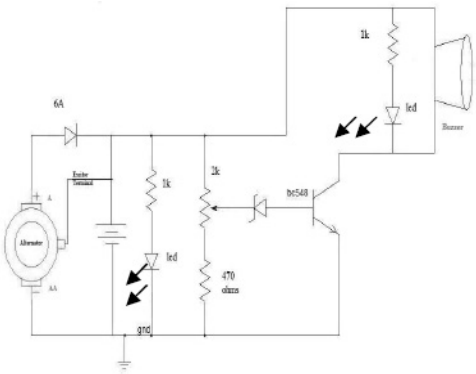
in large-scale mine detection. Furthermore, the operation of the pedal generator does not depend on a non-renewable, environmentally unfriendly resource, as is the case for gasoline-powered electricity generators. Finally, the simple construction of the pedal generator from locally available bicycles will likely consume fewer resources and create less pollution than the production of solar charging technologies and other battery charging devices.

Working Details of Pedal Power Genertor

A. Block diagram



B. Charge control circuit



C. Working

Charging circuit

The output of the motor is given to the battery through a diode of rating 6A which allows only 6A of current to flow. It restricts a current of more than 6A which avoids over flow of the current through battery and also facilitates the unidirectional flow of the current from generator to battery. A resistor and a led in series is connected in parallel with the battery to indicate that the battery is getting charged. A pot (variable resistance) of 2K with 3 terminals is connected. One of the terminals is connected to the positive terminal of battery and the middle terminal is connected to the base of the

transistor BC 548. The transistor conducts and glows the led. The led and the resistor connected in series across the buzzer which glows when the battery is fully charged. The buzzer sounds when the battery is totally charged.

Mechanical design

Considering the friction losses in the belt drive, we switched over to chain sprocket arrangement, which by itself acts as gear mechanism which can be explained as follows.

Consider a sprocket with t1 teeth and rotating at N1rpm another sprocket with t2 teeth and N2 rpm. We have,

$$t1: 1/ N1 \quad (1)$$

$$t2: 1/ N2 \quad (2)$$

Taking ratio of equation 1 and 2 we get,

$$t1/ t2=N2/ N1$$

so we can see that a lower teeth crank yields higher rpm ,so by arranging the way shown below we get the required rpm to drive the motor more efficiently.

Designed model of pedal power generator

D. Test Results and Analysis Plotting of graph

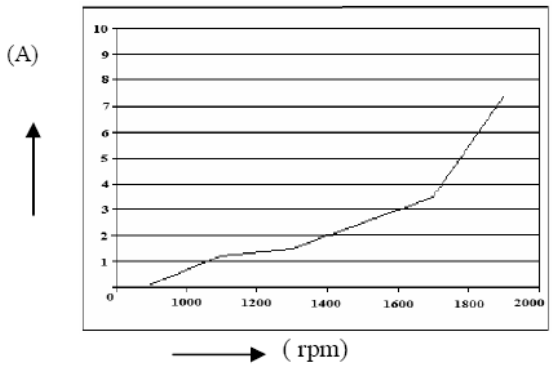


Table 1

Speed (rpm)	Current(A)
900	0.1
1000	0.8
1300	1.5
1500	2.5
1600	3
1800	5.8

Component Specifications

Battery 12 V, 4.5Ah
Alternator 2 V, 25A, @2500rpm

Output Results

We have from the test results that, the minimum power output from the alternator at 900rpm is calculated to be 1.2W and the maximum achievable power from the alternator at 1800rpm is calculated to be 88.8W. So, for a person pedaling continuously for about 45min above 1200rpm which can be achieved conveniently. By our system could easily provide an average power of about 38W through which we can easily charge the specified battery.

Conclusions

It will undoubtedly provide an overwhelming advantage to villagers and for urban people to install it at their convenient places and can be used in energy conversion conveniently. A few modifications in this project will surely capture market, like if we can generate more power with the current design i.e. custom made alternator, etc and with many brains working on this we will surely find it to be a success.

Future scope

When we consider application & cost point of view of our project we find that this has a great scope in future:

- Considering our design's drawbacks with little or no alteration different design can be modified to get required power.
- We can modify two wheeler vehicles according to our design of charging external battery; we can get higher rpm and hence higher output and finally reduce the charging time of the battery.
- Based on this system if we provide a reverse mechanism such that when battery is fully charged it drives the motor, we can make an energy efficient vehicle.

References

[1] Anand Radia, Anupam Singhal e.t.a.l “Pedal Generator Battery Charger”, Mines action Canada technology competition, University of Toronto, May 7th , 2003.
[2] Tim Ogne, Haley Krommenhoek “Pedal Powered Generator for rural Africa”
[3] Michael Mazgaonkar, Ronnie Sabavalla, Ravi Kuchimanchi “Pedal Powered Electricity Generator”, India, July 2001.
[4] Hybrid e-bike http://www.spectrum.ieee.org/geek-life/hands-on