

Design and Evolution of Hybrid Charger for Mobiles and Accessories

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Abstract

Energy is the basic necessity for life, whole world is facing energy crisis and slowly and steadily moving towards the Renewable Energy sources. In the country like India, power cut is a common problem. Present work concerns with the development of a hybrid cell phone charger that is able to charge phone and accessories with and without electricity, the designed charger receives power from four ways Firstly the device is capable of operating by human hand. Basically it consists of small special D.C motors whose shaft is connected with gear and pinion of appropriate diameter for smooth rotation by rotating the shaft by hand it produces pulsating direct current which was saturated at a constant of 3.7 volt by the use of appropriate Zener Diodes, Transistor, Inductor-capacitor filter and resistor. Also the device is capable of receiving power from Sun by the means of special slidable small solar plates whose output terminal is connected to the input terminal of designed Mother board , designed device can be clamped on Train and Car window as it consist special vertical turbine which can be rotated by air received through the window of moving train and other vehicles also it can be operated through electric supply .In this way the present work fulfills four basic needs which are as follows:

1. It would be very useful device to charge cellphones and other accessories when there is no adequate supply of electricity as in rural areas.
2. It would be very helpful for military persons to charge their walky-Talky and other Instruments or to run instruments which require D.C voltage source of nearly 6 volts, where there is no power supply as in forest, desert, hills etc.
3. It would help passengers travelling in train and buses.

4. Last but not least It can be easily portable as it consists of slidable solar plates the whole device is so compactable that is can be easily carried in pocket so it can be named as hybrid travelling charger.

Keywords: Hybrid, slidable solar plates, clamped, inductor-capacitor filter.

1. Introduction

Cell phones have become an extremely popular device in the entire world and it is easy to say they are part of our daily lives. In the year 2010 there was an estimate of over 4.6 billion cell phones worldwide and the number has been growing by more than a billion ever since; this translates to more than half the world's population [1]. However, cell phones need electric sources to charge their batteries in order to work, but there are people in developing countries that find it hard to access electric sources. According to the International Energy Agency, in 2011 1.4 billion people around the world did not have access to electricity [3]. To help with this severe problem present work concerns with the designing of hybrid cell phone charger to provide easy and adaptive method to charge cell phone and its accessories. This charger makes the utilization of Renewable source of energy like solar and wind energy, also charger has capability to charge your cell phone mechanically when there is no sunlight and also no wind energy of appropriate speed. This charger is provided with shaft which can be easily rotated with hand and this rotation is changed into electricity which is capable of charging cell phone.

2. Objective

To design noble and hybrid cell phone charger which can be easily portable and capable of operating mechanically along with renewable energy sources like solar and wind energy.

3. Material and its Specifications

3.1 Slidable Solar plates

A solar cell (also called a photovoltaic cell) is an electrical device that converts the energy of light directly into electricity by the photovoltaic effect[2]. The driving force behind solar panels begins with the photovoltaic cells. These cells are responsible for converting photons from the solar light directly into electrons. The name itself originates from Greek words and can be broken down to photo which means "light" and voltaic which translates to "electricity". Photovoltaic cells are fabricated from special material known as semiconductors which fall right in between conductors and insulators when it comes to the magnitude of electron flow. Normally, the most

commonly used semiconductor is Silicon. Designed charger consists of special slidable solar plates in which one solar plates are mounted over the other in a fashion that it can easily slide over each other.



Figure 1: The special slidable solar plates, this figure was taken from Nikon camera.

As there was two solar plates of whose maximum capacity was 4v each so combined capacity was nearly about 8 volts.

3.2 Special wind turbine

This section consists of vertical wind turbine mounted over propeller, it is a type of fan that transmits power by converting rotational motion into thrust. A pressure difference is produced between the forward and rear surfaces of the airfoil -shaped blade, and a fluid (such as air or water) is accelerated behind the blade. Propeller dynamics can be modelled by both Bernoulli and Newton's third law. A propeller is often colloquially known as screw. Among the advantages of this arrangement are that generators and gearboxes can be placed close to the ground, which makes these components easier to service.



Figure 2: The special designed wind turbine consisting of vertical wind turbine mounted over propeller.

3.3 DC Generator along with gear box

Electric generator is a device that converts mechanical energy to electrical energy. Many motors can be mechanically driven to generate electricity and frequently make acceptable generators. In this designed device electric motor along with gear box is used as an electric generator. A gearbox is a mechanical device utilized to increase the output torque or change the speed (RPM) of a motor. The motor's shaft is attached to one end of the gearbox and through the internal configuration of gears of a gearbox, provides a given output torque and speed determined by the gear ratio. The shaft attached with the gear box can be easily rotated through hand also to produce electricity, as shown in fig. 2.

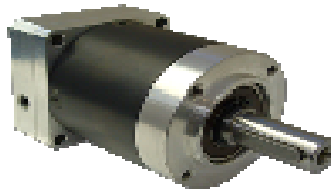


Figure 3: [http://www.anaheimautomation.com/images/gearbox/GBPN-0602\(100x100\).png](http://www.anaheimautomation.com/images/gearbox/GBPN-0602(100x100).png).

3.4 DC Charger kit

For the cell phone to charge, charger output must be above 4V and can deliver a maximum current of 500mA. The charger circuit designed is composed of simple transistor, resistor, capacitor and zener diode as voltage regulator. All the electronic components along with its connection and specifications are shown in fig.4

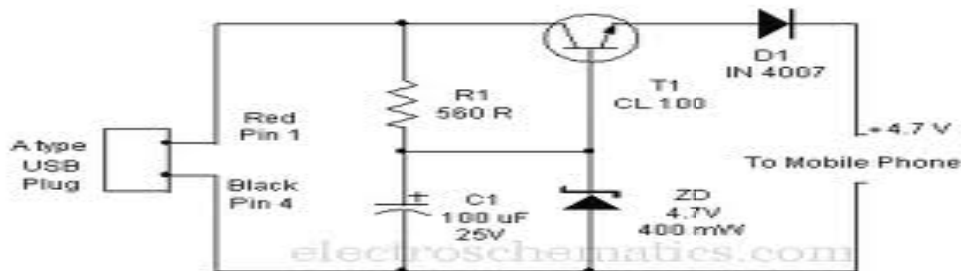


Figure 4: www.electroschematics.com

4. Result and Discussion

All the above listed materials and apparatus such as small dc generator along with gear box, charger kit were packed in the small box of dimension 8cm×4cm×3cm also slidable solar plates one of diameter 6cm was mounted on the top face of the box. Also

in the corner of top face of box vertical wind mill mounted over propeller connected with motor with the help of shaft was adjusted and was uplifted upto that height so that it can rotate easily in less speed wind also and it should not create any disturbance to the solar plate. The mechanism of hand charging through mechanical forces with the help of shaft connected to gear box and gear box connected to small dc generator was also installed, the shaft was made to let out from one of the side face of the box as shown in fig.5 below when one rotate the shaft with the help of hand dc generator generates electricity which is supplied to the input terminal of charging kit. The solar panel installed on the top of box converts solar energy into electrical energy when charger is exposed to sunlight, the electrical energy produced is supplied to the input terminal of charger For charging cell phone from wind energy Generator case installed

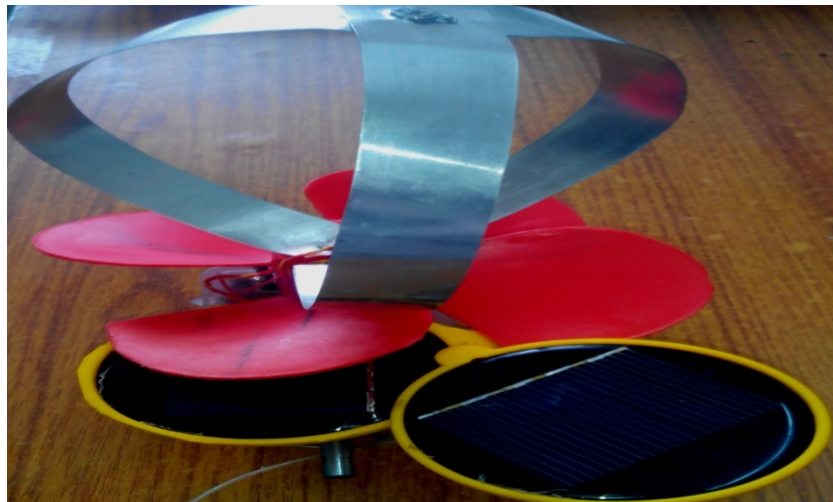


Figure 5: Designed charger having slidable solar plates along with special wind turbine over a box.

with propeller is held in the direction of moving winds. This small but hybrid charger kit can be easily clamped on the window of moving train and other vehicles the fast moving wind rotates the special designed turbine which produce electricity which is fed in the input terminal of the charger. There can be two types of charging methodology one is constant current and other is constant voltage. And here the constant voltage technique is used. Constant Voltage charging, also known as constant potential charging is done with a generator. This generator produces current to charge the battery. The voltage in this type charging system held constant. With a constant voltage, the charging voltage will be high. And when the output terminal of charger is connected with a cell phone it began to charge when it was exposed to sunlight or clamped on moving vehicles or its shaft being rotated with hand.

5. Conclusion

The present work concerns with the development of hybrid cell phone charger which is capable of charging phone and its accessories and other gadgets when there is no electric supply this device was designed to make use of vast quantity of renewable source of energy. Also this hybrid charger is portable, cost-effective and energy efficient. As this charger can be operated from mechanical force also so it can tackle all the emergency condition such as flood, or other natural unhappening when there is no sunlight, no electric supply and no fast moving winds. With suitable modification this device can be made for regular use at homes. This device can be easily clamped on the window of train and other vehicles so that wind that enter through the window strikes the vertical wind turbine and made it rotate and this rotation is utilized for charging phone. In this way it helps passengers specially in trains. Also charger can prove its importance to soldiers who moves in forest, desert, and hills, mountains where wind and solar energy are available in abundance. This way hybrid charger proves to be very efficient.

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