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Solar Power Bank With Safety System

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Abstract— A portable power bank comprising a main body internally defining a chamber in which a battery is mounted. Portable power bank is made by, firstly solar plate connected to charger module then connected to Lithium-ion battery and voltage booster with slide switch and high voltage shock circuit is also connected with push button switch with Lithium-ion battery. Now a day's women safety is the paramount issue in our society. Therefore we attempt to affix a safety system with power bank which is charged by solar energy. Solar energy use natural resource that avoids the pollution also.

Keywords— Solar Plate, Lithium-ion Battery, Charger Module, Voltage Booster, High Voltage Shock Circuit.

I. INTRODUCTION

A power bank is a portable device that can supply power from its built-in battery through a USB port. Power banks are popular for charging USB charged devices. They can also be used as a power supply for various USB powered devices such as lights and small fans. They usually recharge with a USB power supply. The power bank includes a control circuit that both regulates charging of the battery and converts the battery voltage to 5.0 volts for the USB port. Some chargers for cells like 18650s and 26650 can also serve as a power bank. Although it is generally more cumbersome to carry such a charger with cells rather than a conventional power bank, this type of set-up has the advantage of being able to charge cells for other uses. It also has the advantage that, when the cells are dead, they can be swapped by fresh cells for immediate use. The new concept is a portable power bank which is operated at solar energy and also having additional safety system.

A portable power bank comprising a main body internally defining a chamber in which a battery is mounted. And containing two units. First unit is for charging purpose. Which contain solar plate, charger module, Lithium-ion battery and voltage booster.
Second unit is for safety purpose which contains solar plate, charger module, Lithium-ion battery and high voltage shock provider circuit.

II. RELATED WORKS

As the popularity of portable electronics increases, mobile power banks are necessary to ensure that devices remain available when working outdoors for long periods of time; for example, a cell phone used on a trip could be recharged from a mobile power bank. Although a power bank can extend the electricity capacity of the devices to a certain degree [4]. The present invention relates to a portable power bank, that is conveniently portable and use solar energy for charging mobile phone and also provide a high voltage shock to offender in an emergent situation.

III. DESIGN ISSUE AND CONSTRAINTS

A. Solar plate

Solar cell absorbs sunlight as a source of energy to generate electricity. Solar cell modules use photons from the sun to generate electricity through the photovoltaic effect. Module is made up of wafer-based crystalline silicon cell. Depending on construction, solar cell modules can produce electricity from a range of frequencies of light. It produces only direct current electricity. Its sizes are about 11cm × 4 cm. It needs maintenance. A dirty solar cell can reduce its power capabilities by up to 30% in high dust. Wattage 5v.

Figure 1. Simple solar plate

B. Charger Module TP4056

The TP4056 1A Lithium-ion battery charger module is a complete constant - current /constant - voltage linear charger for single cell lithium-ion batteries. Its SOP package and low

external component count make the TP4056 ideally suited for portable applications. TP4056 can work within USB.

Figure 2. Charger Module

C. Lithium-ion Battery

A lithium–ion battery is a type of rechargeable battery for portable electronics, with a high energy density, no memory effect and low self- discharge. It becomes discharge by moving lithium-ions from the negative electrode to the positive electrode and back for charge.
Specific power ˷250 – ˷340 W/kg.
Charge/discharge efficiency – 80 % – 90 %.
Self – discharging rate - 0.35% to 2.5% per month depending on state of charge.

Figure 3.Lithium-ion battery

D. Voltage Booster

A boost converter (step-up converter) is a DC-to-DC power converter that steps up voltage (while stepping down current) from its input (supply) to its output (load).

Power for the boost converter can come from any suitable DC sources such as batteries or solar panels. As its function is to step-up, hence its output voltage is greater than the source voltage. It is a class of switched-mode power supply (SMPS) containing at least two semiconductors (a diode and a transistor) and at least one energy storage element a capacitor, inductor, or the two in combination.
Input voltage (0.9 – 5) V DC.
Output voltage - 5 V DC.
Output current - (500 - 600) mA.
High conversion efficiency maximum to 96%.

Figure 4. Voltage Booster

E. High Voltage Shock Circuit

We use this high voltage circuit from mosquito racket which is used here, for providing shock to the offender as it functions in mosquito racket. This circuit provides shock by increasing low AC voltage to high AC voltage by transform connected in the circuit. It uses 3.7v lithium-ion battery which is converted to 100V (AC) in the circuit and again it increases to the 5 KV (AC) with the help of step-up transformer.

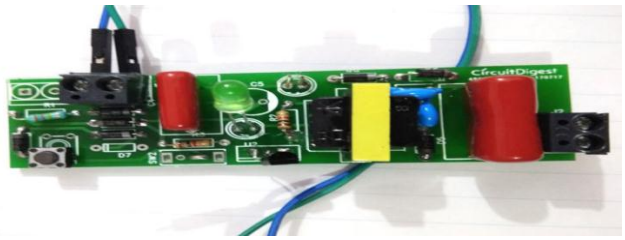

Figure 5. High Voltage Shock Circuit

IV. BLOCK DIAGRAM OF PORTABLE POWER BANK WITH SAFETY SYSTEM

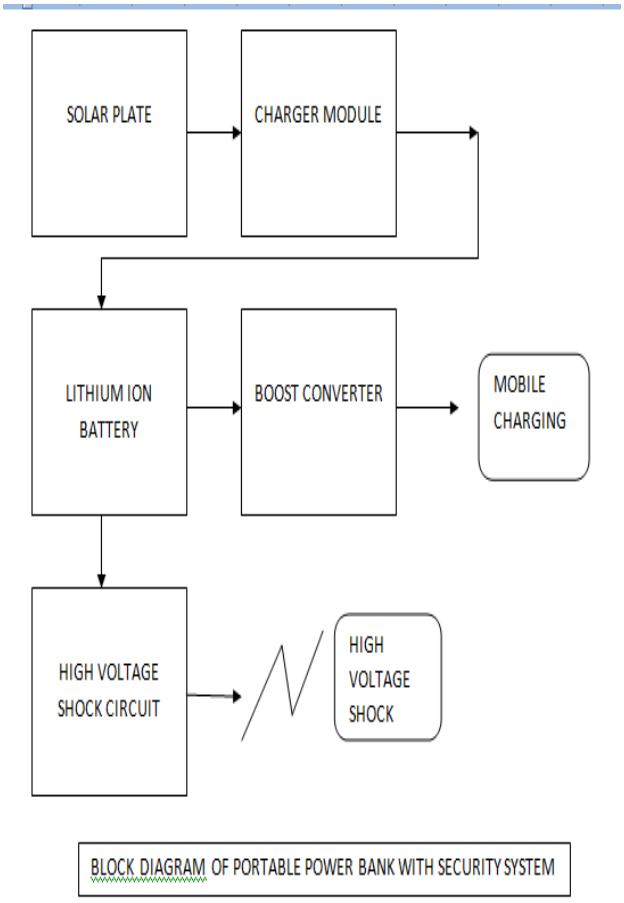

Figure 6. Block Diagram

V. CIRCUIT DIAGRAM

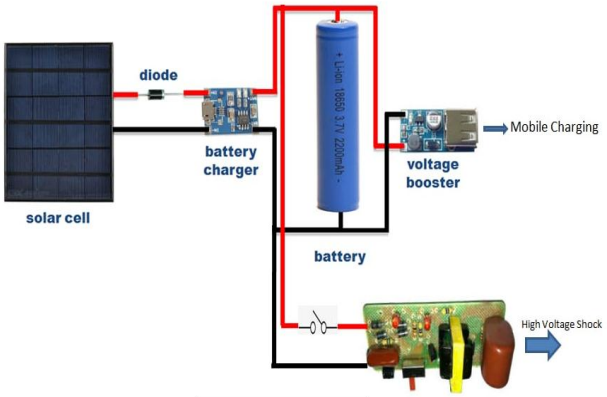

Figure 7. Circuit Diagram of Power bank with safety system

VI. WORKING MODULE

A. Solar Lithium-ion Battery Charging Circut

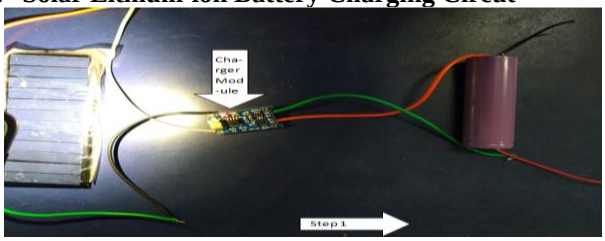

Figure 8. Battery is charging through charger module using solar energy

The first function is to be performed by the power bank is to charge the lithium-ion battery. Because the lithium–ion battery is rechargeable that's why we use it here. When the sun light falls on the solar plate it starts supply energy to the lithium – ion battery through charger module TP4056 to store energy in it and that energy can be use further in the circuit for different function. We use here lithium – ion battery of 3.7V of 2000 mAh.

Charger module TP4056 indicates the battery charging – discharging through LED. While the battery is charging red LED glows throughout the charging duration. And whenever the battery becomes full charge instantly the blue LED glows.

B. Low Voltage To High voltage

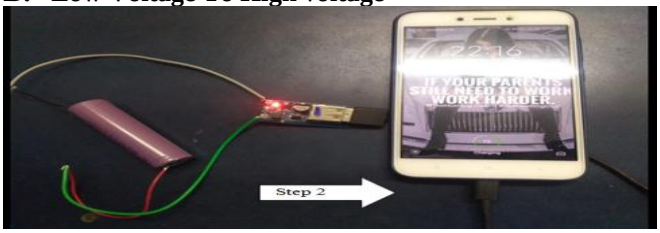

Figure 9. Cell phone is charging through voltage booster By using lithium-ion battery

Now the battery voltage needs to boost up to 5V for charging the mobile phone. After charging the lithium–ion battery up to desired voltage we connect a voltage booster or step–up voltage converter.

Here lithium–ion battery is connected to the step–up voltage converter which increases the voltage up to 5V so that we can charge our cell phone

C. High Voltage Shock Provider Circuit As Women Safety System

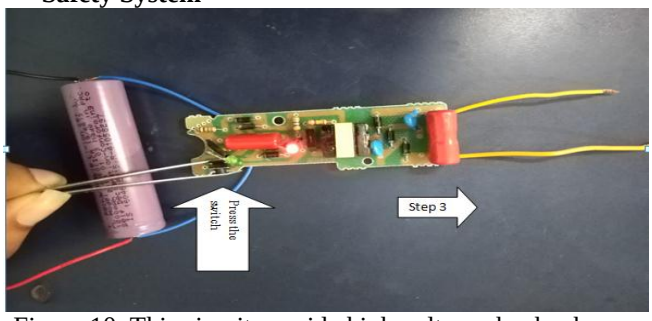

Figure 10. This circuit provide high voltage shock when we press the switch

A high voltage shock provider circuit we use from mosquito racket. It perform the same function as it does in mosquito racket instead of mosquitoes it provide the shock to offenders. Shocking process is controlled by providing a switch in the circuit.

VII. HARDWARE IMPLEMENTATION

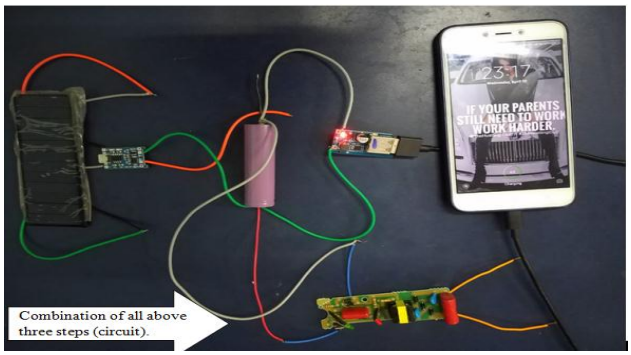

Figure 10. Hardware assemble of all three steps

Here we assemble all the above 3 steps to make a portable solar bank for women safety. First of all lithium-ion battery starts charging through charger module by using solar energy then charge stored in battery is used for charging cell phone and also used by high voltage shock circuit to boost the voltage for shock.

VIII. FUTURE WORK

- We are trying to make it useful for chargeable wireless device.

- We are also trying to make this power bank as a study lamp.
- GPS (location notification).

IX. CONCLUSION

In this paper we introduce a low cost solar portable power bank with safety system. The purpose of this power bank is to use natural resources to charge the portable device (which somehow reduce the pollution) and simultaneously provide women safety (which is more concernant issue in our society). Therefore we affix a safety system with power bank. Which provide a nasty shock to the offender. So it can be used as a charging source as well as a weapon at the time of emergent situation.

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