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Solar Powered Battery Charger for Mobile Charging

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Abstract: *By the utilization of renewable sources of energy we can overcome the exhaustible use of power and charge. The objective of the research is to develop a solar powered mobile battery charger. It can be effectively used in the remote areas having scarcity of electricity. In built solar panel converts solar energy into electrical energy. Charge is transferred to the battery for storage and further use. Micro controller is attached to the battery for indicating the percentage of charge present in the battery. Charging circuit with USB port is attached to the battery.*

Key words*: battery, energy, electrical, phone, renewable, solar energy, solar panel*

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I.INTRODUCTION:

Global energy consumption has rapidly increasing now days. It is expected to result in depletion of fossil fuel energy and problems related to global warming. Renewable energy has become a more important resource and abundant available sources. One of the most popular sources of renewable energy is solar energy. Solar powered mobile phone chargers convert solar radiation into electrical energy for the purpose of charging the batteries of mobile phones. It reduces the environmental pollution and is much user friendly. Power supply is an issue of great concern in densely populated and remote areas. Citizens find it very difficult to charge their mobile phones. Charging through public charging centres are inconvenient. This paper presents the idea of development of a solar powered mobile battery charger. To control the fluctuations in the solar energy output solar energy system is usually backed up with a battery by using a controller.Even in the remote areas having scarcity of power this method can be used for mobile charging.

II. RELATED WORKS:

[5] Paper presents the method which is implemented in the laboratory in the year 2016.System consists of units and blocks which make up the entire solar charging device. The power source is solar radiation. DC-DC conversion is carried out with power electronic convertor called chopper and is used to provide regulated power supply. It is the backup which charges the mobile phones. The backup system consists basically of two lithium ion battery. Here the LM358 operational amplifier and LED, 7805 voltage regulator has used.Proteus software has used for simulation.

[3] This research designed a solar powered portable power bank for mobile phones. It has inbuilt solar panel which converts solar energy into electrical energy. The charge is then transferred to the battery. After conducting the experiment it is concluded that in order to operate with high Efficiency, micro controller requires 12V,so there is need of a battery of minimum 12V.The panel wings should be placed under direct sunlight for better efficiency.

[5] This paper describes the mobile charger using solar tracking system with coin as the method of payment. Light sensors are placed for detecting the intensity of radiation; there by sending the data to the micro controller, because of this, drivers can move the panel for efficient solar tracking. Lead acid battery is used for storing power. Coin based IR sensor detects coin to be placed for service payment.37W solar panel, with 2A; supply current is the source of power here. This method is an intelligent solar tracking method. This method receives maximum energy from sun during earth rotation .But according to its size, it's not convenient, as it are bulky, large sized solar panels.[7] Students of electronics and communication engineering, department of the American University of RAS Alkhaimah, UAE, proposed a mobile charging station with portable solar charger with controlled charging current for Mobile phone devices. Cut off at saturation point was ensured by Zener diode to avoid the breakdown of the system. Solar panel with 5w,17.6v,0.28A and a NPN transistor type 2N2222,Zener diode with breakdown voltage v=5.6v,LED,potentiometer,capacitor and resistors has used here .But this system was never perfect as heat dissipation ,which may lead to the danger of the system. Size of the system also increased here. [11]We have used the On the Go (OTG) extension to take the energy or the power from the other smart phone that we carry along and installed a circuit at the other end in order to make it more

efficient and reliable. A-device acts as a USB host with the B-device acting as a USB peripheral. The host and peripheral modes may be exchanged later by using Host Negotiation Protocol (HNP). If an uncharged capacitor C is connected across the terminals of a battery of voltage V, the transient current flows as the capacitor plates charge up. However, the current stops flowing as soon as the charge Q on the positive plate reaches the value Q=CV.

At this point, the electric field between the plates cancels the effect of the electric field generated by the battery, and there is no further movement of charge. Thus, if a capacitor is placed in a DC circuit then, as soon as its plates have charged up, the capacitor effectively behaves like a break in the circuit. In this paper, a low-cost method of charging mobile batteries has been designed for travellers, or people of rural and remote areas where the current supply is not available all the time. Now the necessity of carrying a power bank while travelling is also relaxed. This OTG is very useful in today's life because now days the necessity of communication is very important especially while moving from one place to another. Travellers can easily charge their phones by using this OTG cable simply by borrowing a Smartphone from the other passengers for few minutes. The proposed OTG cable is compact, simply designed and cheap.[13] The system comprises a step-down DC/DC converter to charge a battery using solar energy with MPPT and a single-phase inverter (220 V/50 Hz) with a low total harmonic distortion (THD). A microcontroller PIC 16F876 is selected to design an algorithm which is used to detect the maximum power of the solar energy along with its operation. In addition, the microcontroller is also used to control pulses of the inverter, resulting in decreased inverter losses and a simple filtered output voltage. With this method, a DC/DC converter is developed using a digital signal processing (DSP) platform, and the results obtained show that the output from the solar panel is increased by 15%. Next, Alberto et al. Investigated and developed a solar-battery charger using a microcontroller. The developed charger can increase the output power by 25%, and the MPPT efficiency reaches 95%. Salas et al. present a battery charger that uses solar energy based on a microcontroller.

[10] Discuss an interleaved boost –convertor method which is connected in parallel with a DC-link capacitor in each switch. An experimental prototype was used to test the proposed concurrent charging technique.

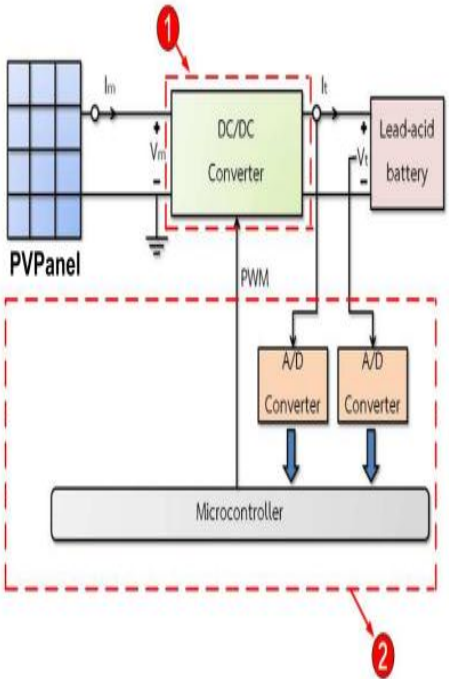

FIGURE1: Schematic block diagram of battery charger controller [13].

III. METHODOLOGY:

When solar panels are open, sunlight direct falls on the photo voltaic cell of the panel and converts solar energy into electrical energy. Solar panel of 12 V, 50W is using. Voltage boosting system with DC to DC convertor circuit converts dc voltage value to a high dc voltage value. Energy that is supplied to a battery can be calculated by the product of power generation rating of solar panel (measured in watts)with the number of hours the panel is exposed to sunshine.

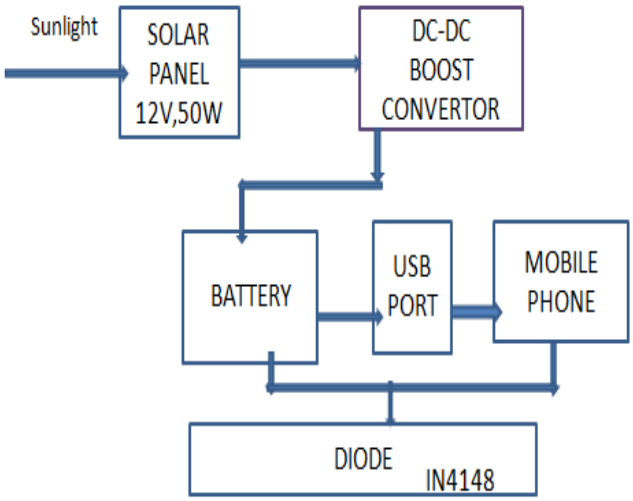

FIGURE 2: Energy Conversion Diagram [5] [4].

Battery of 12V, 20 A is connected in series. Mobile charging circuit is connected to the battery which is further connected to a USB port. LEDs are attached to the solar panel side. This helps in detecting the flow of charge. Charge flows to the battery, if the voltage is appropriate. Battery of 20A, 12V is using here. IN4148diode is using here, which prevents the current to travel in reverse direction. This diode's operating junction temperature is 175degree C, whereas forward surge current is 4A.

There is LED, which displays the transfer of charge from panel to the battery. When the battery is charged perfectly up to the full capacity, percentage of charge present in the battery can be shown in the micro controller. We can connect a mobile phone at the end of the circuit.

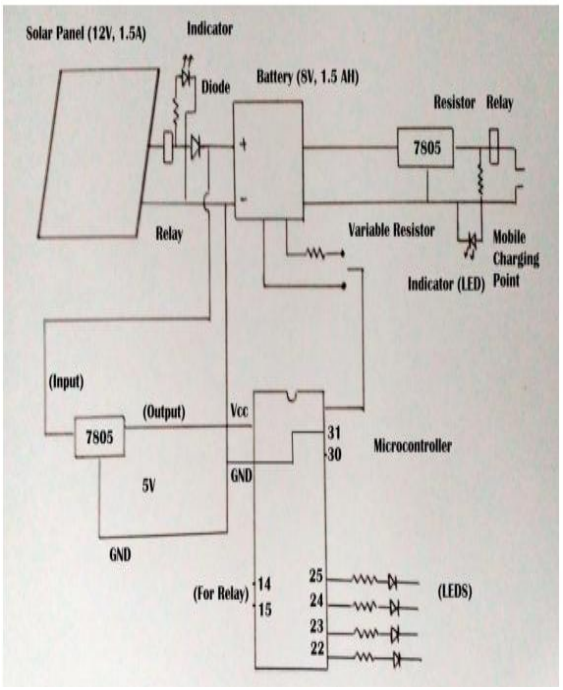

FIGURE3: Circuit Diagram [4] [6]

Micro controller checks and allows the required amount of flow of charge. Micro controller signals the relay the voltage fluctuations and relay off the circuit. Circuit becomes open. Thus it protects the circuit also.

1V. CONCLUSION:

After this study we concluded that this method of charging that utilizes the renewable sources of energy which helps us to overcome the exhaustible usage of power and charge. It reduces the environmental pollution and is much user friendly. During disasters and also in remote areas, it can be used with ease and with a long and forever durability of device and power. It also minimizes the use of unnecessary wires and cables. The device is efficient and reliable.

V. PROBLEMS FACED:

For better charging sunny weather is necessary.
Charging battery from solar panel consumes more time.
Battery storage capacity is also one of the problems faced

VI. SUGGESTED IMPROVEMENTS:

LCD can also use instead of LED for display.
By the fabrication of panels and by proper doping a higher power solar panel can be made in order to increase the efficiency.
Hybrid energy storage solar charger can be use in order to maintain the limitations of the battery.
Use of mirrors as solar concentrators can also improve the efficiency of the Solar Panel.

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