Solar Mobile Charger

Prof. Dhirendra Deode[1], Priyanka Pawar[2], Vaishnavi Dahiwale[2], Deeksha Sahu[2], Vedika Satpute[2]

[1]Assistant Professor, Department of Electrical and Electronics Engineering, Shri Balaji Institute of Technology and Management, Betul, Madhya Pradesh, India
[2]Student, Department of Electrical and Electronics Engineering, Shri Balaji Institute of Technology and Management, Betul, Madhya Pradesh, India

Abstract
The increasing demand for portable electronic devices, particularly mobile phones, has led to the need for efficient and sustainable charging solutions. Solar mobile chargers harness solar energy to power mobile devices, offering a renewable and environmentally friendly alternative to conventional chargers. This abstract explores the design, components, and functionality of solar mobile chargers, emphasizing their benefits, limitations, and potential for widespread adoption in both urban and remote areas. Key aspects such as solar panel efficiency, battery capacity, and charging speed are discussed, along with considerations for durability, portability, and affordability. Additionally, advancements in technology and emerging trends in solar charging are highlighted, underscoring the importance of continued innovation in this field to address the growing demand for clean energy solutions. This project is cheap in cost, easy to operate, pure form of energy and it will drastically benefit the community.

Keywords: Solar panel, Battery, Charge controller, Charging module, multi USB cable, connecting wires

1. INTRODUCTION

Solar mobile chargers harness the power of the sun to generate electricity, offering a renewable and eco-friendly alternative to conventional chargers. These compact and portable devices feature photovoltaic panels that capture sunlight and convert it into electrical energy, which is then stored in built-in batteries or directly used to charge mobile devices such as smart phones, tablets, or cameras.

In this guide, we'll explore the functionality, benefits, and applications of solar mobile chargers, highlighting their role in promoting energy efficiency, environmental sustainability, and enhanced mobility for users on the go. Whether you're an outdoor enthusiast, a traveler, or simply seeking a greener way to power your devices, solar mobile chargers offer a versatile and eco-conscious solution for staying connected anytime, anywhere.

2. LITERATURE SURVEY

Solar energy is the energy produced directly by the sun and collected elsewhere, normally the Earth. The sun creates its energy through a thermonuclear process. The process creates heat and electromagnetic radiation. Only a very small fraction of the total radiation produced reaches the Earth. The radiation that does reach the Earth is the indirect source of nearly every type of energy used today. The exceptions are geothermal energyand nuclear fission and fusion[1]. Vedic literatures in India even state the use of flying machines which were powered using the sun. Coming21st century, we have come a long way in developing solar cells which are the devices powering our future, converting sun'senergy into electricity. This work is about using non conventional energy i.e. solar energy for mobile battery charging. Solar chargers are simple, portable and ready to use devices which can be used by anyone especially in remote areas. Solar panels don't supply regulated voltage while batteries need so for charging. Hence, an external adjustable voltage regulator is used to have the desired constant voltage[2]. Every day in this modern era, a new technology is introduced in a mobile phone, and one major concern that every mobile phone user has is its battery backup. Whatever the advancements in mobile phones, the chargers we use have remained consistent since the beginning[3].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[4].

3. BLOCK DIAGRAM

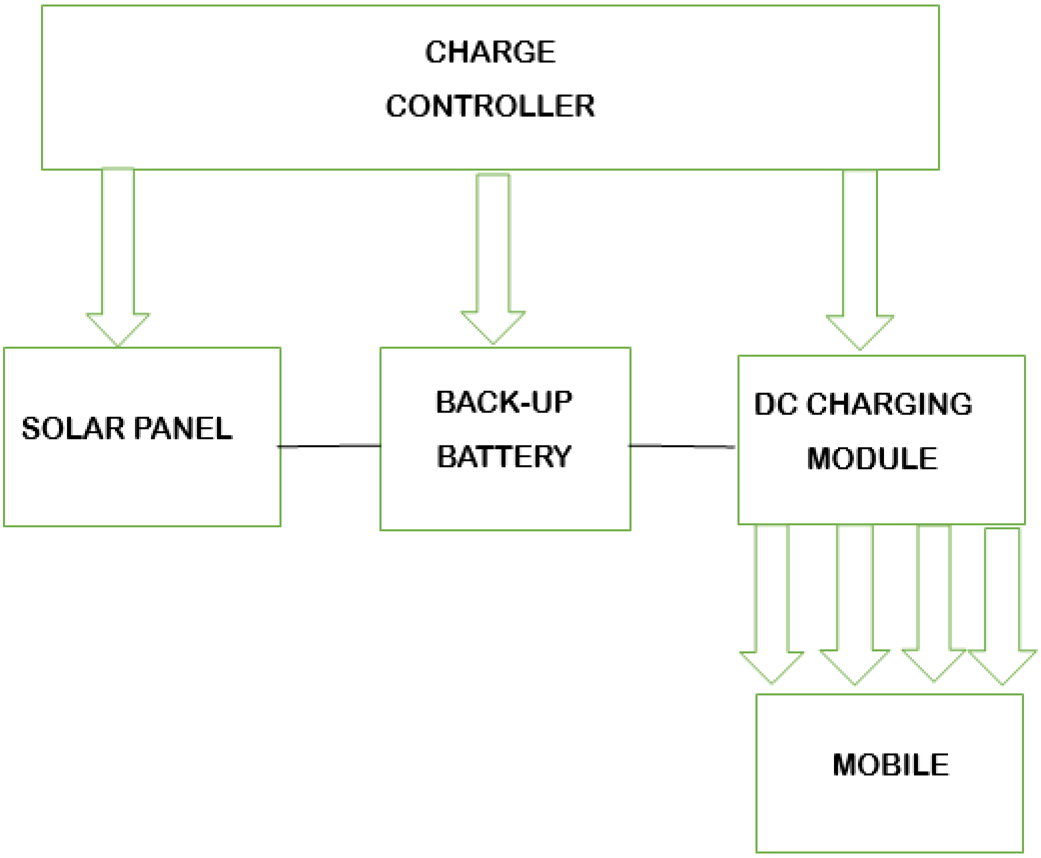


Figure: Block diagram of Solar Mobile Charger

4. Problem Statement

The major factor that drove us to this project is that it is one the method of charging that utilizes the renewable sources of energy where we can overcome the exhaustible usage of power and charge. It reduces the environmental pollution and is much user friendly. Solar charger needs light to work. The efficiency of the Solar panels has increased greatly over the last decade or so, reaching the point where they do not need direct sunlight to work but will now create a satisfactory current even under overcast conditions.

- Component used:- 1) Solar panel
  2) IC
  3) Capacitor
  4) Resistor
  5) LED
  6) Heat sink
  7) Battery
  8) Charge controller
  9) Charging Module

1) Solar Panel**:-**A solar panel is a device that converts light into electricity. It typically consists of a base plate, photovoltaic (PV) cells, and optical concentrators. The PV cells convert direct light into electricity, while the optical concentrators focus the light onto the PV cells . Solar panel arrangements can be designed in various ways. One arrangement involves vertically stacking multiple solar panels with a predetermined distance between them, based on the solar elevation angle and the length of each panel . Another arrangement includes solar panel structures installed in a solar power plant park, with a shield to protect cultivation tanks or plantations in the intermediate space between the structures. The solar panel structures have two-sided solar panels, and the shield has a partly reflecting surface to reflect radiation back towards the solar panels Additionally, a solar panel arrangement may include panels with different transmittance and reflectance properties, allowing for the absorption of radiation to generate electrical energy . Finally, a solar panel system can be designed with an array of panels arranged parallel to a support surface, with air inlets and outlets between the panels. This system uses a duct formed by walls to facilitate airflow and cooling

2)IC:-An integrated circuit (IC) is a structure that includes multiple metal layers and inter-level dielectric layers, with conductive elements interdigitating between metal guard structures. These IC devices can have fin-type active areas with nanosheets and gate lines, as well as insulation structures and fences. Additionally, IC reactor heating systems can be used to generate high-temperature hot water for heating waste water, utilizing biogas and recovered waste heat. IC chip cards consist of a card body with an integrated IC chip module, including contact pads and chips interconnected to process signals. These modules may also have conductive protrusions connected to embedded conductive contacts in the card body

3)Capacitor:-A capacitor is a passive electrical device used to store electrical energy by generating a potential difference. It consists of two conductors separated by a dielectric medium. The capacitance of a capacitor depends on the dimensions of the electrodes and the dielectric constant of the material used. Capacitors can store energy in the form of an electrical charge, similar to a rechargeable battery. They are made up of parallel conductive plates separated by an insulating layer called the dielectric. Different types of capacitors are available, each with unique properties.

4)Resistor:-A resistor is an important component in electric and electronic circuits. It can be manufactured using various methods, such as by providing a layer of thermally conductive material on the resistive body and pressing electrodes against it to obtain a desired thickness . Variation in the thickness of the thermally conductive layer can be suppressed by using a method that involves forming an uncured first thermally conductive layer, curing it, laminating an uncured second thermally conductive layer, and bending electrode plates to adhere the resistive body and the electrode plates together . In the manufacturing process, the resistor body can be pressed between a limiting barrel and a coating barrel to improve the quality of the paint film coated on the resistor body . A resistor can be made with materials such as copper, nickel, and lanthanum boride, with a content of at least 40% by mass, and can be used in circuit boards and electronic devices

5) LED:-LED technology is the focus of the papers provided. Gismondi describes an LED lighting lamp with a transparent light-guide plate that extracts light through engraving patterns on its surface. Chen discusses an LED chip with a reflecting layer that adjusts the emission direction of light to improve light field directivity. An presents a method for manufacturing an electronic device using micro LEDs, ensuring stable electrical connections and lower defect ratios. Bong introduces an LED module for lighting fixtures that securely fixes a metal PCB to a heat sink, improving heat dissipation without damaging performance . Kim and Kim describe a multi-pixel package with pixel groups and a control circuit, reducing the size of the unit pixels and control circuit in a single package.

6) Heat sink:-A heat sink is a passive component used to dissipate heat away from electronic components such as processors, graphics cards, or power transistors. It typically consists of a metal structure with fins that increase the surface area for heat dissipation, allowing heat to transfer from the component to the

surrounding air more efficiently. Heat sinks are crucial for maintaining the temperature of electronic devices within safe operating limits.

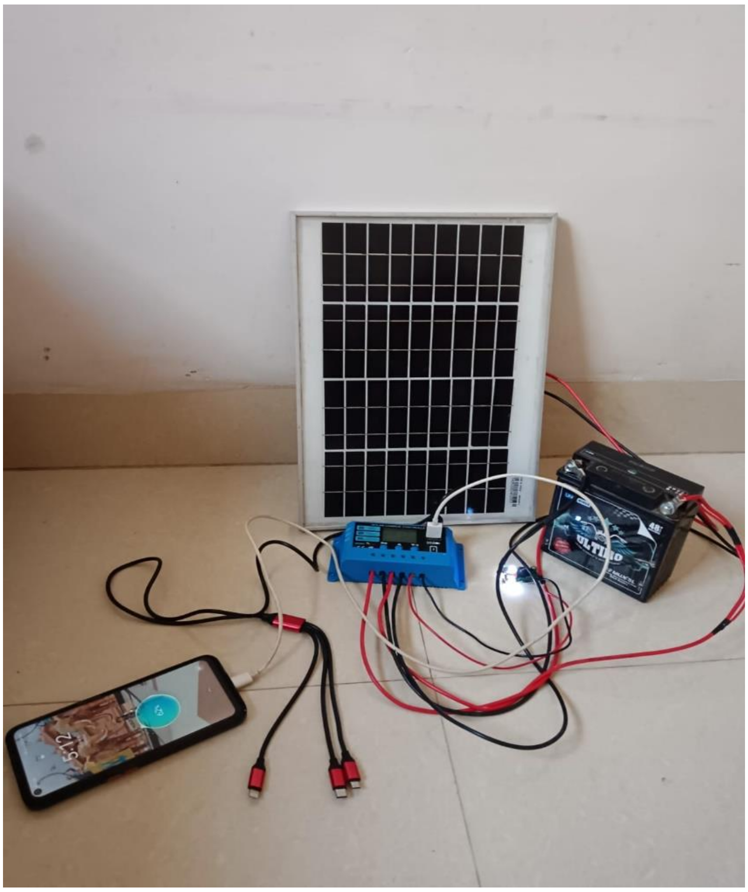
7) Battery:-As batteries become more prevalent in grid energy storage applications, the controllers that decide when to charge and discharge become critical to maximizing their utilization. Controller design for these applications is based on models that mathematically represent the physical dynamics and constraints of batteries. Unrepresented dynamics in these models can lead to suboptimal control. Our goal is to examine the state-of-the-art with respect to the models used in optimal control of battery energy storage systems (BESSs). This review helps engineers navigate the range of available design choices and helps researchers by identifying gaps in the state-of-the-art. BESS models can be classified by physical domain: state-of-charge (SoC), temperature, and degradation. SoC models can be further classified by the units they use to define capacity: electrical energy, electrical charge, and chemical concentration. Most energy based SoC models are linear, with variations in ways of representing efficiency and the limits on power.

8)Charge controller:- A charge controller is a device used to control the charging process of a battery. It ensures that the battery is charged efficiently and safely. The charge controller can perform various functions such as pre-charging an intermediate circuit before charging the battery controlling a piezoelectric actuator without the need for feedback sensors or complex models converting the supply power from an external power source to match the allowable charging voltage and current ranges and controlling the charging of a secondary battery by using a current limit function of an external power supply. Additionally, a charge controller can determine whether the secondary battery is being used during the charging process and stop the charging before the battery is fully charged.

9) Charging module:-A charging module is a component used in various charging systems. It can improve the working efficiency of wireless charging dual-mode receiving ends by enabling series resonance and maintaining a preset interval between alternating voltage and induced electromotive force. In the context of a vehicle charging module, it consists of an electric charging socket housed in a dish-shaped bulge of a vehicle body, along with a lid that can be swung open or closed using two arms. The arms and lid form a parallelogram to move the lid parallel to the body surface, allowing for easy access to the charging socket. Another charging module design involves a DCDC conversion circuit, low-frequency and high-frequency charging units, and a controller. The low-frequency and high-frequency coils are arranged to be centrally offset and partially overlapped, eliminating self-resonance and improving power transmission efficiency. Additionally, a wireless charging module for a portable power supply includes a housing with inclined slide rails and a slide block for locking the power supply in place, providing a simple structure and an anti-theft function.

5. Working

Solar Mobile Charger



A solar mobile charger works by converting solar energy into electrical energy to charge a mobile device. The process involves using a solar panel to capture sunlight and convert into electricity. The solar panel can be tilted towards the sun to maximize its efficiency. The electrical energy generated by the solar panel is then stored in a battery for later use to charge a mobile phone. This allows the charging process to start, utilizing the stored electrical energy from the solar panel . This technology is particularly beneficial in rural areas with limited access to energy.

6. Advantages

1) Utilize Renewable sources.

2) Uses low Input voltages to produce high voltage spikes of output for charging.

3) Useful for users in remote areas and portable for travellers.

4) To save the electricity bill cost in the long run.

5) Reduce environmental pollution.

7. Result

The result of solar mobile charger technology is the ability to wirelessly charge electronic devices using solar energy. This technology utilizes a solar panel to convert solar energy into electricity, which is then wirelessly transmitted from a transmitter circuit to a receiver circuit .Magnetic resonance coupling is used in this research, as it is more efficient and beneficial than magnetic inductive coupling. The efficiency of wireless power transfer is currently at 11 percent, resulting in some electricity wastage. However, this technology has the potential to be a future charging option for electric automobiles, drones, medical equipment, and cell phones, eliminating the need for cables . Additionally, solar mobile chargers can be beneficial in rural areas with limited access to energy, providing a convenient and cost-effective charging solution.

8. Conclusion

A solar mobile charger works by converting solar energy into electrical energy to charge a mobile device. The process involves using a solar panel to capture sunlight and convert it into electricity. The solar panel can be tilted towards the sun to maximize its efficiency. The electrical energy generated by the solar panel is then stored in a battery for later use. To charge a mobile phone, the user needs to plug the phone into the input port and insert a coin into a coin sensor module . This allows the charging process to start, utilizing the stored electrical energy from the solar panel. This technology is particularly beneficial in rural areas with limited access to energy

Reference

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