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REVIEW OF SMART CHARGING SYSTEM FOR PORTABLE ELECTRONIC DEVICES

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ABSTRACT

In today's fast-paced world, the dependence on mobile devices has become a necessity for many people. However, one of the biggest challenges faced by individuals on the go is the constant fear of their devices running out of battery[1]. This inconvenience can be particularly frustrating for those in a rush or without access to traditional charging outlets. In response to this problem, there has been a growing interest in providing instant smart device charging opportunities through renewable energy harvesting. This article explores the various developments in portable and stable large charging stations that utilize renewable resources such as solar, wind, and hand crank generators to generate power for charging mobile devices[2]. Solar energy is produced by the sun and converted into electricity through solar cells. Solar chargers are now being used to charge mobile batteries, especially in remote areas. Research has been done to provide itinerant charging facilities for smart devices, with developments in portable and stable large charging stations. These systems are based on renewable resources and can be used for public or commercial purposes, providing instant smart device charging on the go. The integration of solar cells and LED charging capabilities into mobile devices offers a sustainable and convenient way to keep devices powered up, regardless of location or access to traditional power sources[3]. This innovation not only benefits individuals but also contributes to reducing the overall carbon footprint associated with charging mobile devices. By providing eco-friendly charging options and reducing reliance on traditional methods, this advancement has the potential to revolutionize the way, it powers the devices on to go.

Keywords – Solar Energy; Solar Panels; Mobile Charging; Renewable Energy; Photovoltaic Cell

INTRODUCTION

Imagine being able to charge your smartphone or tablet simply by walking around, or by placing it in direct sunlight. This is the future of smart device charging, made possible by the integration of renewable energy sources into our everyday technology[4]. The first component of this innovation is the use of miniature solar cells directly integrated into smart devices. These solar cells are designed to efficiently capture sunlight and convert it into usable electrical power, allowing the device to charge itself whenever it is exposed to sunlight. This means that users can simply leave their

devices out in the sun, whether they are at the beach, hiking, or even just sitting in a sunny spot, and their devices will be charging without the need for any external power source. This development is set to revolutionize the way we think about smart device charging[5]. No longer will users be tied to electrical outlets or have to carry bulky portable solar panels to keep their devices charged. Instead, they will have the freedom to charge their devices wherever they go, using renewable energy sources that are readily available in their environment. By reducing reliance on traditional power sources and integrating renewable energy directly into smart devices, this innovation not only provides a convenient and sustainable power option for users but also contributes to a more environmentally friendly approach to technology. It is a promising step towards a future where our devices are powered by clean, renewable energy, making smart device charging more accessible and eco-friendly than ever before.

LITERATURE REVIEW

Solar mobile phone chargers are a convenient and environmentally friendly way to charge your devices on the go. These chargers utilize solar cells to convert sunlight into electrical energy, which is then used to charge the battery of a mobile phone or other electronic devices[6]. The efficiency and performance of a solar mobile phone charger depend on various factors, including the type and capacity of the solar cells, the presence of converters, and the characteristics of the light source.

The converters in a solar mobile phone charger are essential for regulating and adjusting the voltage and current from the solar panels to match the requirements of the battery or device being charged. Buck converters, boost converters, and buck-boost converters are commonly used to transfer energy from the solar panels to the battery efficiently. Additionally, maximum power point tracking (MPPT) converters may be included to optimize the power output from the solar panels.

The characteristics of a solar cell, such as voltage, current, size, weight, and transparency, play a crucial role in determining the overall performance of a solar mobile phone charger. The size and capacity of the solar panel required to charge a specific device depend on its power requirements. Factors such as the intensity of sunlight and the capacity of the solar cell phone charger also influence the charging time for a mobile phone[7].

Lithium-ion batteries are commonly used in mobile phones and other electronic devices. These rechargeable batteries consist of cells in which lithium ions move between the negative and positive electrodes during discharge and charging. The development of rechargeable lithium-ion batteries dates back to the 1960s, with ongoing research and advancements in battery technology[8].

Solar mobile phone chargers offer a sustainable and portable charging solution for electronic devices. Understanding the components and characteristics of solar chargers, as well as the properties of lithium-ion batteries, can help users make informed decisions when selecting and using these devices[9].

WORKING OF A SOLAR MOBILE PHONE

Solar Photovoltaic- Solar Photovoltaic technology involves the use of solar cells, also known as photovoltaic cells, which directly convert solar radiation into usable electricity through the photoelectric effect. The capacity of the solar system and the number of solar panels needed depend on the amount of power required from the system.

Charge controller The charge controller regulates voltage and current between solar panels and battery to extend battery life and prevent overcharging and deep discharging.

Battery-Solar-powered charging systems can have either lead-acid or lithium-ion batteries. Lead-acid batteries are common because they are cheap, but they are heavy, require frequent maintenance, and are best suited for large, stable charging stations. On the other hand, while lithium-ion batteries are expensive, they are suitable for both portable and stationary solar-powered charging systems. The inclusion of additional features depends on the system's output and demand, location, and solar hour of the installation area. However, in general, all solar systems have some common features.

Converters: The use of converters depends on the output voltage requirement.

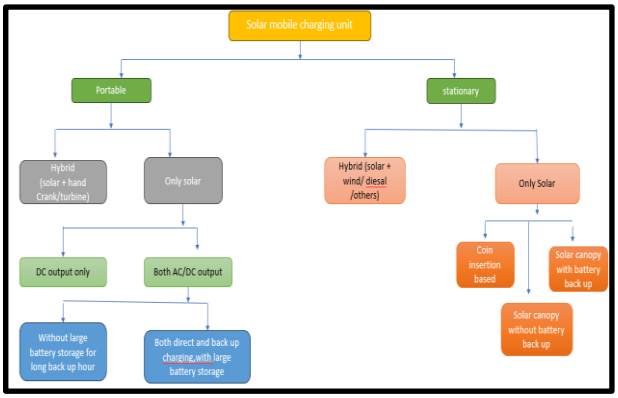

Fig 1. Portable classification of solar-powered charging unit

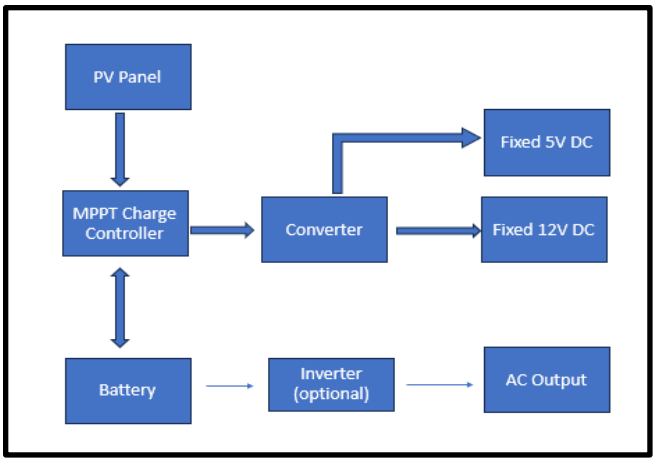

Fig 2. Block Diagram of General System Configuration

Table 1. Solar Mobile Around World

S .no	Mobiles	Mfd. year
1	Samsung E1107	July 10, 2009
2	Samsung S7550 blue earth	Feb 13, 2009
3	LG POP GD510	Released 2009, Oct
4	Nokia 1611	Jan, 1997
5	Puma	Released 2010, Aug
6	Tesla x I phone	17 May, 2018

Samsung guru 1107

The **Samsung E1107** (also known as *Crest Solar* or *Solar Guru*) is a mobile phone designed for a rural lower-budget market. It was first released in India. The battery supports up to 570 hours of standby or 8 hours of talk time. It can be charged through the solar panel for an additional 5-10 minutes of talk time per hour of charging. According to the user manual, the phone is not

supposed to run on solar power alone for an extended period.

Fig 3. Samsung guru 1107

Tesla x iPhone

Russian accessory producer Caviar has commenced sales of a "Tesla" version of the iPhone X selling for $4,500 with the first off the production line to be offered to Elon Musk. Apple iPhone x Tesla price in India is expected to be Rs. 304,877. Apple iPhone X Tesla is expected to be launched on 30th August 2018.

Fig 4. Tesla x iPhone

Advantages of inbuilt solar cells on mobile phones-

1. Cost-effective: Solar chargers do not require electricity, making them a cost-effective option for charging mobile phones.
2. Versatile: Solar chargers can be used with all types of mobile phones, making them a versatile charging solution.
3. Uninterrupted power supply: Solar chargers can provide an uninterrupted power supply, allowing users to charge their mobile phones even during power outages.
4. Emergency purposes: Solar chargers are ideal for emergencies and outdoor activities, as they do not require access to an electrical outlet.
5. Compact design: Solar mobile phone chargers are compact and easy to carry around, making them a convenient charging option for on-the-go use.

Disadvantages-

1. Dependence on sunlight: Solar chargers require sunlight to function, so they may not be suitable for use in areas with limited sunlight or during cloudy weather.
2. Slow charging: Solar chargers typically charge devices slower than traditional electrical chargers, which may not be ideal for users who need a quick charge.
3. Limited capacity: Solar chargers may have limited capacity and may not be able to fully charge a mobile phone in one go, especially if the sunlight is not consistent.
4. Fragility: Some solar chargers can be fragile and may not withstand rough handling or outdoor conditions, making them less durable than traditional chargers.
5. Initial investment: While solar chargers can be cost-effective in the long run, the initial investment in purchasing a solar charger may be higher than traditional chargers.

DISCUSSION

Mobile phones have an average thickness of 0.5 cm, with the actual thickness ranging from 0.893 cm to higher values. The phone battery runs on DC 3.7v and can have a capacity of either 2000 mAh or 5000 mAh, providing 7.4wh of power.

Provide a phone charger with an input range of 100-240V AC, an output of 9.0V 1.67A and 5.0V 2.0A, and a 50/60 Hz frequency with 0.5A current.

The phone measures approximately 7 inches by 3.7 inches. We require solar cells that are 5 inches by 3 inches.

CONCLUSION

Solar mobile phone chargers offer a sustainable and convenient charging solution by converting

sunlight into electrical energy through solar cells. The efficiency depends on factors like solar cell type and converters. Lithium-ion batteries in mobile phones are compatible with these chargers. Ongoing research aims to enhance solar cell efficiency and versatility. Renewable energy sources, including solar and wind power, are vital for addressing the energy crisis and reducing environmental impact. Advances like transparent solar cells and hybrid systems hold promise for diverse applications. Solar mobile chargers offer advantages such as ripple-free DC power, extended battery life, and high versatility. Ongoing developments focus on increasing solar cell efficiency and creating fully transparent cells for mobile displays. Installing solar canopy-style charging stations in sunny areas and using solar-wind hybrid systems in suitable locations can provide continuous, eco-friendly power. This revolution in renewable energy applications promises significant cost savings and a healthier environment, encouraging wider adoption of sustainable energy and reducing dependence on conventional power sources.

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