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Solar Power Bank with Wireless Charging

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ABSTRACT: This project revolves around the development of a solar-powered portable charger equipped with wireless charging functionality. Harnessing solar energy through embedded photovoltaic cells, the power bank offers a sustainable and on-the-go power solution. The inclusion of wireless charging technology adds convenience to device charging, catering to the growing demand for cable-free experiences. This abstract summarizes the project's focus on combining solar efficiency with wireless convenience, aligning with the pursuit of eco-friendly and user-friendly energy solutions.

I. INTRODUCTION

In an era driven by technology and marked by our ever-increasing reliance on mobile devices, finding sustainable and efficient ways to power our gadgets on the go has become a pressing concern. The Solar Power Bank with Wireless Charging Project is a forward-thinking solution designed to address this challenge. This innovative project combines the power of renewable energy with the convenience of wireless charging, offering a portable, eco-friendly, and reliable energy source for all your mobile devices. In this introduction, we will explore the key features, benefits, and the environmental impact of this exciting endeavor. Join us on this journey to harness the sun's energy to power your world, wherever you are..

II. LITERATURE SURVEY

[1] Publish by, Prof. Rupali Tirale, Miss Aakansha Mahirale, Miss Rohini Ingale, Miss Dipali Ingale, Miss Snehal Ingale, Miss Gokula Punde, Miss Priya Suryawanshi, Miss Anjali Suralkar, Mr. Rohit Tekade:

The main aim of this paper is to develop a solar power bank with inverter system to generate 230V AC output. The solar power bank system is for charging mobile phones using wireless power transfer coil. This system can be designed with minimum number of circuit components. We are going to implement here a wireless mobile charging concept, a wireless charging is a type of charging which uses electromagnetic field to transfer energy through electromagnetic induction, energy is transferred through devices through the process of electromagnetic induction. Power banks are one of the most needed things these days but even power bank needs charging, for that one needs to get the power bank charged in a power plug. This is not always possible when travelling or when outside so here we are going to design a smart solar powered power bank with AC outputs. Using this system we are able to charge cell phone through wireless charging or using AC charger.

[2] Publish by, Arun Agarwal, Sambandh Dhal:

power banks are one of the need to have product these days. But even power banks need charging. For that one needs to get the power bank charged in a power plug. This is not always possible when travelling so here we design a smart solar powered folding power bank. The solar power bank integrates solar charging with efficient battery support and wireless charging to provide a multi-functional unique power bank product. The device is able to self-charge anywhere during day time so that he user never runs out of power.

[3] Publish by, nevoproject:

The use of solar power banks with wireless charging has become increasingly popular in recent years as a convenient and eco-friendly solution for charging mobile devices. However, these devices have limitations such as dependence on sunlight, slower charging speeds, limited charging capacity, and inconsistent charging in indoor or shaded

environments. This literature review of research conducted between 2017 to 2022 shows that while users generally have positive attitudes towards these devices, further research is needed to improve their performance and usability. Factors such as sunlight intensity, temperature, and device compatibility can affect their efficiency and charging speed. Understanding these advantages and limitations can help users make informed decisions about whether a solar power bank with wireless charging aligns with their charging needs and priorities.

Problem Definition

Design and develop a solar-powered portable charging solution that integrates wireless charging technology. The objective is to create a versatile power bank capable of harnessing solar energy for on-the-go charging while providing the convenience of wireless charging for compatible devices.

Objective:

1. Efficient Solar Energy Harvesting:

Develop a solar panel system that maximizes energy conversion from sunlight to ensure optimal charging capabilities, taking into consideration factors like size, weight, and charging efficiency.

2. Wireless Charging Compatibility:

Implement a reliable and efficient wireless charging module compatible with a wide range of devices, adhering to industry standards and ensuring seamless charging for smartphones, smart watches, and other compatible gadgets.

3. Battery Capacity and Management:

Design an internal battery system with sufficient capacity to store solar-generated power efficiently. Implement smart battery management to optimize charging and discharging cycles, ensuring long-term reliability.

4. Portability and Durability:

Create a compact and lightweight design suitable for outdoor activities, travel, and emergency situations. Ensure the power bank is durable, capable of withstanding various environmental conditions.

5. User-Friendly Interface:

Develop an intuitive user interface with clear indicators for solar charging status, battery levels, and wireless charging activation. Prioritize user experience for seamless operation.

6. Integration of Safety Features:

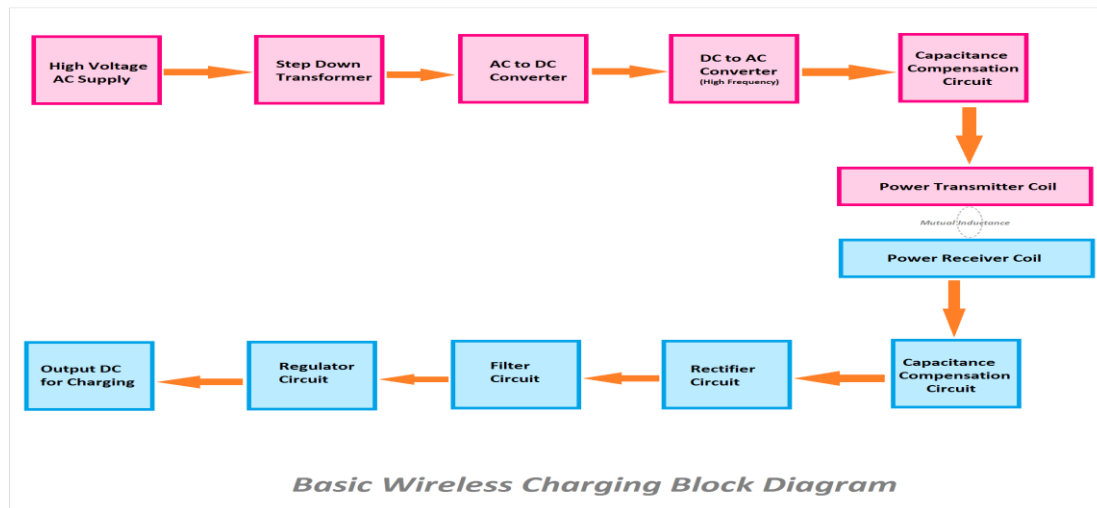
Implement safety features such as overcharge protection, temperature control, and short-circuit prevention to guarantee user safety and protect the electronic components.

7. Market Compatibility and Cost-Efficiency:

Consider market trends and competitive pricing to ensure the product is accessible to a wide range of consumers. Balance features and costs to provide value for users.

By addressing these challenges, the goal is to create a Solar Power Bank with Wireless Charging that offers a reliable and sustainable charging solution for users who prioritize portability, versatility, and eco-friendly energy sources.

Block Diagram



III. PROPOSED METHODOLOGY OF SOLVING IDENTIFIED PROBLEM

The aim of this project is to design and develop a solar-powered portable charger equipped with wireless charging capabilities, providing users with a sustainable and convenient solution for charging their devices on the

1. System components

a) Solar Panel:



Panels, are devices that convert sunlight into electricity. They consist of solar cells made of semiconductor materials, like silicon, which generate direct current (DC) electricity when exposed to sunlight. These cells are grouped together on a panel, and multiple panels can form a solar array.

The photovoltaic effect occurs within the solar cells, where photons from sunlight knock electrons free from atoms, generating an electric current. This current is then captured and converted into usable electricity through an inverter, which changes the DC electricity produced by the panels into alternating current (AC) electricity compatible with most household appliances and the electrical grid.

Solar panels are used in various applications, from residential rooftops to large-scale solar farms. They offer a renewable, clean energy source, reducing reliance on fossil fuels and contributing to a more sustainable future. The efficiency of solar panels continues to improve, making them more accessible and cost-effective for generating electricity.

b) **Wireless charging module:**



A wireless charging module consists of a transmitter and a receiver. The transmitter, usually a charging pad or stand, generates an alternating electromagnetic field. The receiver, embedded in a device like a smartphone, picks up this field and converts it back into electric current to charge the device's battery. These modules use electromagnetic induction or resonance to transfer power without the need for physical connectors, providing convenience and ease of use. They come in various standards like Qi, PMA, or proprietary systems, with different power output capabilities. The technology has been adopted in various devices, from smartphones and wearable to electric vehicles and furniture.

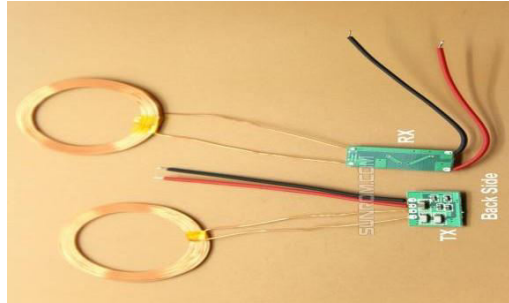
c) **DC-DC Buck converter LM2596:**



The LM2596 is popular DC-DC buck (step-down) converter chip designed by Texas instruments. Its widely use in various electronic devices to step-down voltage levels efficiently.

- 1) **Input voltage:** Typically accepts input voltage ranging from 4.5V to 40V.
- 2) **Output voltage:** Adjustable output voltage from 1.5V to 37V.
- 3) **Output Current:** The maximum output current is around 3A, but these can vary based on the specific module or design.
- 4) **Efficiency:** Known for its decent efficiency, often around 80- 90 % depending upon the input /output voltage differential and load conditions.
- 5) **Features:** It includes over current protection, thermal shutdown and adjustable frequency operation.

d) **Wireless power Tx / Tr Module:**



Wireless power transmission involves transferring electrical energy from a power source to an electrical load without the need for physical connectors. A wireless power transmitter typically consist of power source that converts electrical energy into an oscillating electromagnetic field this field is then captured by a compatible receiver, which converts it back into electric energy to power a device.

Transmitter often uses coils to create magnetic fields, employing principle of electromagnetic induction. This system can be operate based on various technologies like electromagnetic resonance, inductive coupling, or radio frequency. They come in different from small charges for phones to larger system for industrial or medical applications.

The receiver, equipped with a compatible coil or antenna, captures the transmitter energy and converts it back into electric power.

Advantages:

1. Easy Wireless Charging for compatible phones.
2. Solar Self Charging.
3. Foldable Design for Portability.
4. 20000maH battery backup.
5. Added USB Type Charging port availability.
6. Adjustable output voltage.
7. Circuit is simple.
8. Circuit uses commonly available components.
9. Zero battery discharge when sunlight is on the solar panel.

Disadvantages:

1. It has a limited battery Life.
2. The circuit may get Expensive.
3. Cloudy days do not produce as much energy.



IV. CONCLUSION

In conclusion, the solar power bank with wireless charging project demonstrates a promising fusion of renewable energy and convenience. By harnessing solar power, this innovative device offers a sustainable solution for on-the-go charging. The added feature of wireless charging enhances user experience, making it a versatile and eco-friendly option for powering our increasingly digital lives. As we embrace cleaner technologies, projects like these pave the way for a greener and more efficient future.

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