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SOLAR CAP WITH MOBILE CHARGING

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Abstract: As the population is increasing day by day, the need and demand for fossil fuels also increases. But formation of fossil fuels takes millions of years and the existing fossil fuels can exhaust in less than a decade. Hence, it is important to find suitable compensation. Renewable sources of energy is abundantly available in nature. Conventional energy sources can be more efficient and are inexhaustible. A solar cap is one such project wherein solar energy or sunlight can be used for various applications or purposes avoiding the use of non-renewable resources. Solar caps can be used to cool down the heat with the help of a fan incorporated into it. The fan has three levels low speed, medium speed and high speed.

Each one of us are dependent on technology and especially on mobile phones. Hence, a solar cap is useful in charging mobile phones with instant power supply generated with the help of solar energy or sunlight. This is helpful even in remote areas as it requires only sunlight. Thus, solar caps are quite reliable and cost-effective for many people who are travel enthusiast, people who live in remote areas and also to people who usually are fascinated about trekking and climbing.

Index Terms Solar Energy, Sunlight, Solar Cap, Renewable Energy Sources, Non- Renewable Energy Sources.

Introduction

The world is facing major issues like huge reduction of fossil fuels daily. Every country gives more focus on utilization of solar energy instead using fossil fuels. So, solar harvesting devices like solar cells and solar photovoltaic that can produce electricity by utilization of solar energy should be used. The aim is particularly on summer days, the users will get more relaxed - they can feel cool and make them more efficient by cooling their head and face. Each work will not be complete in the home or in the office, so in some cases even during summer workers must do their work under any certainty of weather condition that cases caps will give them some respite. Manual labor work in hot temperature causes water and salt imbalance in their body. Even in the construction industry, there is a lack of protection, which can be fulfilled by this cap. This cap can provide safety and will make them relax and thus making this research idea more beneficial. The degree of comfort also depends on the metabolic rate of any person – under the influence of high temperature, a huge increase in sweating and evaporation can also be noticed to maintain adequate body temperature.

Circuit Diagram

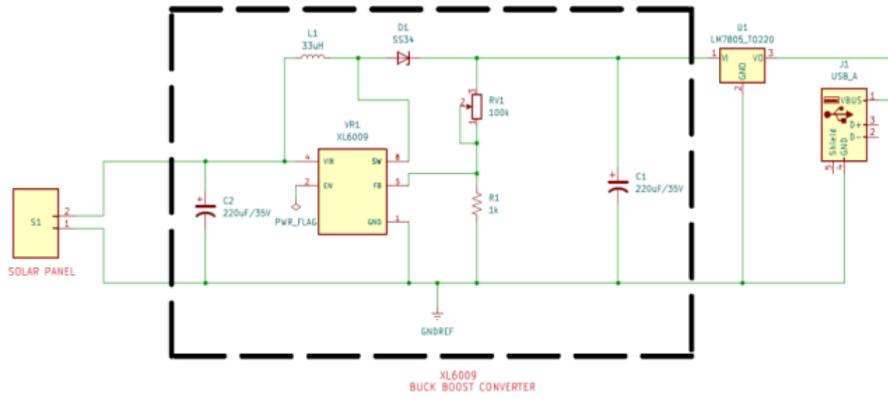


Fig. circuit diagram of solar cap with mobile charging

The positive terminal of the solar panel is connected to the input positive terminal of the booster. The negative terminal of the solar panel is connected to the input negative terminal of the booster. The capacitors in the booster charge and discharge electrons and the Zener diode boosts the voltage. The positive output terminal of the booster is connected to the input of the 5V regulator. The output negative terminal of the booster is connected to the ground of the voltage regulator. The output of the voltage regulator is connected to the positive terminal of the charging module or USB port. The ground of the voltage regulator is connected to the negative terminal of the charging module.

I. WORKING PRINCIPLE

The solar panel converts sunlight into electrical energy. This energy is stored in the battery. The same electrical energy is stepped down with the help of a 5V regulator and supplied to the charging module. In this charging module devices up to 5V can be charged. Battery power is used to run the fan. The fan basically has three speed levels, that is, low speed, medium speed and high speed. This can be set as per the individual's requirement. During daylight hours, the PV panels absorb sunlight and convert it into direct current (DC) electricity. This electricity is then either stored in batteries for later use or directly supplied to the charging ports to power or charge mobile devices. The stored energy in batteries can be utilized when sunlight is not available, such as during night-time or cloudy weather conditions.

II. COMPONENTS SPECIFICATIONS

Solar panel

The solar panel is integrated into the cap. These panels capture sunlight and convert it into electrical energy. It converts sunlight using PV (Photovoltaic) cells.



Fig. solar panel

Buck Boost Converter

A booster is a device that increases the voltage or current of an electrical signal. Boosters are often used to amplify signals in various applications such as audio amplifiers, power supplies, and telecommunications equipment. They can be implemented using different techniques and components, such as transistors, operational amplifiers, or specialized integrated circuits.



Fig. buck boost converter

5v Regulator

5V regulator (7805) is used to regulate the produced voltage into 5V DC to supply energy to the mobile charger & fan. This component maintains a stable output voltage to power the devices connected to the solar cap. It ensures that the voltage supplied to the devices remains within safe operating limits.



Fig. 7805 5v regulator

USB Connector

These are the output ports on the solar cap where one can connect their electronic devices for charging. They provide a convenient way to access the stored solar energy for powering various devices.



Fig. usb connector

III. BLOCK DIAGRAM

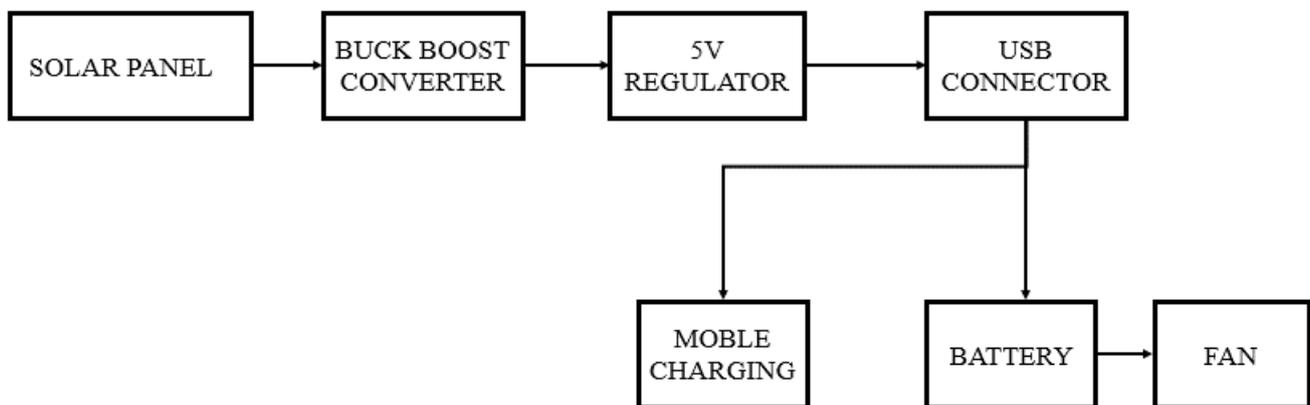


Fig. Block Diagram of Solar Cap with mobile charging

The block diagram consists of a solar panel, regulator, battery, booster, charging module and a fan. The solar panel is connected to the battery and booster. One end of the booster is connected to the solar panel and the other end is connected to a 5V regulator. It can boost voltage up to 35V. The 5V regulator is connected to the USB module or USB port. This regulates the voltage to 5V. The voltage regulator is also connected to the battery. The fan runs with the help of the power supply given from the battery. Devices under the range of 5V can be charged through the charging module. The battery is connected to the fan. Fan consists of three speed levels, that is, low speed, medium speed and high speed. This can be set according to one's requirement.

IV. OBJECTIVES

- ✓ It is used for cooling purposes during daytime.
- ✓ It provides instant power supply to various appliances.
- ✓ By utilizing renewable solar energy, solar caps contribute to sustainability efforts by reducing carbon emissions and environmental impact associated with fossil fuel-based energy generation.
- ✓ Solar caps serve as a reliable power source for essential communication devices during emergencies or power outages.

V. RESULT

Thus, solar cap with mobile charging project is a versatile project that runs with help of solar energy or solar power. We get 5.2V from the solar panel. It is then boosted using buck boost converter to around 12V. The output of the buck boost is given to LM7805 Voltage Regulator to regulate the voltage to 5V. The output of the regulator is given to the USB header to charge various devices under the range of 5V. This method is efficient and is used for multiple purposes. It uses renewable source of energy. Therefore, it causes no harm to the nature or environment and reduces the dependence on fossil fuels or non-renewable resources.

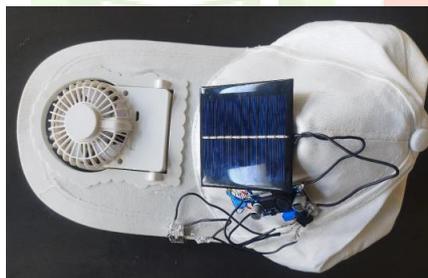


Fig. Solar cap with mobile charging

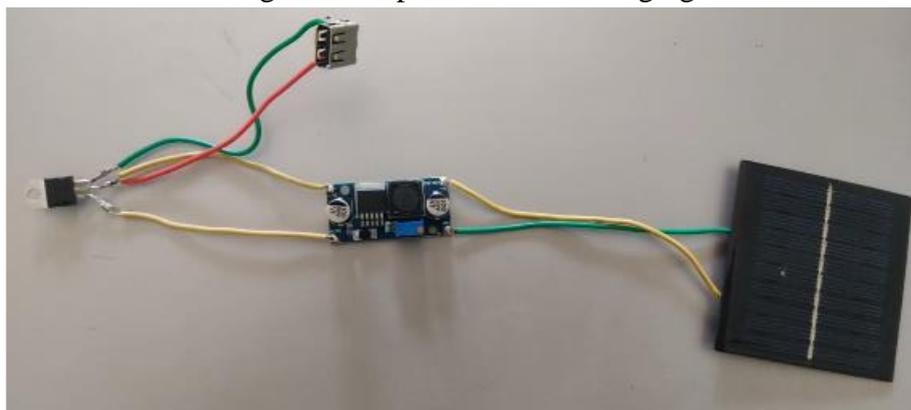


Fig. Circuit Connection of Solar cap with mobile charging



Fig. testing of the circuit connection

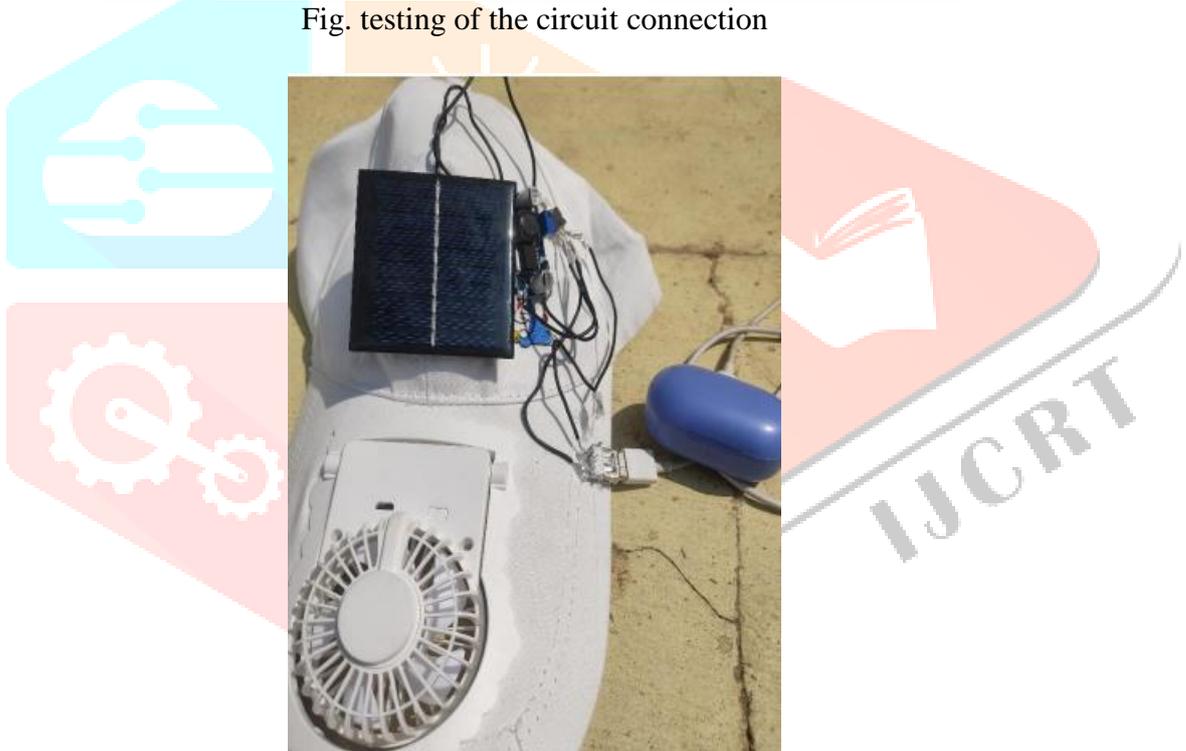


Fig. Final output of solar cap with mobile charging

VI. CONCLUSION

In this project, the solar cap is used as a power source to charge devices up to 5V especially in remote areas. It is also used as a source of breeze necessary to beat the heat. It is done by providing a fan which also runs with the help of solar energy. This project makes use of renewable energy sources, that is, solar power or sunlight for multiple applications with causing any kind of pollution making it environmentally friendly. Overall, solar caps offer a versatile and environmentally friendly solution for various outdoor activities and applications, providing both shade from the sun and a renewable source of power. Solar caps provide a convenient and eco-friendly way to harness solar energy.

8.1 Future Scope

- ✓ Solar caps could be integrated with other wearable technologies, such as smartwatches or fitness trackers, to enhance their functionality and provide a sustainable power source for these devices.
- ✓ Continued advancements in solar panel technology could lead to more efficient and lightweight solar caps, increasing their appeal and usability.
- ✓ Solar caps could become popular among outdoor enthusiasts and travelers who rely on portable electronic devices like GPS devices, cameras, or smartphones.

8.2 Advantages

- ✓ Solar caps reduce reliance on fossil fuels and contribute to a cleaner environment.
- ✓ Solar caps are portable and can be worn outdoors, allowing users to charge their devices on the go without needing access to traditional power outlets.
- ✓ Users can charge their devices directly from the solar cap without the need for additional cables or power banks, making it a convenient and hassle-free charging solution.

8.3 Disadvantages

- ✓ The size and surface area of solar caps limit the amount of energy they can generate, which may not be sufficient for charging larger devices or multiple devices simultaneously.
- ✓ Solar caps rely on sunlight to generate power, so they may be less effective in cloudy or overcast conditions, reducing their usability during inclement weather.

8.4 Applications

- ✓ Solar caps can be used during outdoor activities such as hiking, camping, fishing, or gardening to provide shade from the sun.
- ✓ It is used for charging small electronic devices like smartphones or GPS devices.
- ✓ In emergency situations or during power outages, solar caps can serve as a reliable source of power for lighting.
- ✓ Workers in construction or other outdoor labor-intensive industries can benefit from solar caps by having access to hands-free lighting and charging capabilities, enhancing safety and productivity on the job.

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