PORTABLE SOLAR POWERED CHARGING STATION

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in fulfillment of the requirements for the degree of
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DECLARATION

I declare that this thesis entitled " Portable Solar Powered Charging Station " is the result of my own research except as cited in the references. The thesis has not been accepted for any degree and is not concurrently submitted in candidature of any other degree.

Signature : Ainur Izzati

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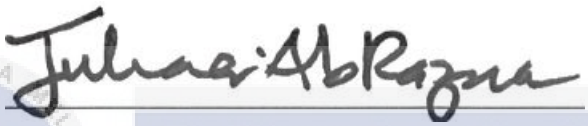
Date : 18 JAN 2022

APPROVAL

I hereby declare that I have checked this thesis and in my opinion, this thesis is adequate in terms of scope and quality for the award of the Bachelor of Mechanical Engineering Technology (Automotive) with Honours.

Signature : 

Supervisor Name : Prof. Madya. Ts. Juhari Bin Ab. Razak

Date : .....18 JAN 2022.....

DEDICATION

Dedicated to

My honourable father, Mas Kamarulzaman Bin Mas Mohamed,

My precious mother, Hamizah Binti Dolah@Abdullah,

My beloved brothers, Mas Muhamad Ikmal Bin Mas Kamarulzaman,

Mas Muhamad Ikram Bin Mas Kamarulzaman,

My beloved sisters Mas Aida Izzaidah Binti Mas Kamarulzaman,

Thank you so much

ABSTRACT

Since non-renewable energy sources are becoming scarce on Earth, it is becoming increasingly vital to rely on renewable energy sources to meet everyday demands. Cell phones have become an indispensable element of life and their importance is rising to the point that they must be charged at all times. In this project, suggests a solar powered mobile phone cahrging method. Solar energy is captured and stored in rechargeable battery. We design, develop, test and evaluate electrical circuits that may be used as portable solar chargers for mobile phones that use solar energy as a power source in this report. A appropriate tiny solar panel is chosen, which is easy to transport to locations outside of the metropolitan power system. In an outdoor emergency, the power source is advantageous since it eliminates the typical method of waiting to be recharged near an electrical outlet. We provide a unique electronic design and construction with significant benefits in terms of battery charge current control. This covers on-circuit investigations and practical testing of charging capabilities.

ABSTRAK

Oleh kerana sumber tenaga yang tidak boleh diperbaharui menjadi langka di Bumi, menjadi semakin penting untuk bergantung pada sumber tenaga yang boleh diperbaharui untuk memenuhi permintaan sehari-hari. Telefon bimbit telah menjadi elemen kehidupan yang sangat diperlukan dan kepentingannya meningkat sehingga mesti dicas setiap masa. Dalam projek ini, mencadangkan kaedah cahrging telefon bimbit berkuasa solar. Tenaga suria ditangkap dan disimpan dalam bateri yang boleh dicas semula. Kami merancang, mengembangkan, menguji dan menilai litar elektrik yang mungkin digunakan sebagai pengecas solar mudah alih untuk telefon bimbit yang menggunakan tenaga suria sebagai sumber tenaga dalam laporan ini. Panel solar kecil yang sesuai dipilih, yang mudah diangkut ke lokasi di luar sistem kuasa metropolitan. Dalam keadaan kecemasan luar, sumber kuasa menguntungkan kerana ia menghilangkan kaedah menunggu yang biasa diisi semula berhampiran saluran elektrik. Kami menyediakan reka bentuk dan pembinaan elektronik yang unik dengan faedah yang signifikan dari segi kawalan arus cas bateri. Ini merangkumi penyiasatan dalam litar dan ujian praktikal keupayaan mengumpat.

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^{o} C	-	Degree Celsius
W/m2	-	Watt per Meter Square

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CHAPTER 1

INTRODUCTION

1.1 Background

Energy usage has always had a considerable environmental impact. Fast-growing world population, rising income and the resulting appetite for fuel have resulted in rapid rise in the demand for energy, necessitating the use of renewable resources to meet that demand. To achieve energy efficiency and environmental sustainability, must make the change to renewable energy as soon as humanly possible. Power is one of the most pressing concerns with smartphones, tablets and laptops. People have not been yet able to create energy sources that are as efficient as modern electronics. In reality, many devices may drain a normal battery in a matter of hours from a full charge. This project aim to develop a solution that will use solar energy provide power for charging devices.

The conversion of sunlight into electricity is known as photovoltaic energy. A photovoltaic cell, also known as a solar cell or PV, is device that converts solar energy directly into electricity. Sunlight is composed of photons or solar radiation rays. The different wavelengths in the solar spectrum lead to different levels of energy in these photons. Photons can be mirrored, passed straight through or absorbed as they hit a photovoltaic cell. Just the photons that have been absorbed provide enough energy to produce electricity. Solar panels can turn free and nearly limitless energy produced by the sun into electricity.

Solar power is now being used in a wide variety of products today, including calculators, water heaters and are just a few examples. Smaller electrical equipment, such as garden lighting and street lights, are also powered by solar energy. As solar energy is introduced to power small electrical items, we now know that battery chargers will use it as well. In fact, charging the battery using solar cells is one of the most cost-effective solutions because it is simple to set up and the energy collected from the sun is free.

The solar-powered battery charger is also good for the environment because it runs on recycled electricity and avoids chemical pollution by allowing alkaline batteries to be reused multiple times before being discarded. Because it requires minimal maintenance and can convert solar energy straight into electricity, this battery charger has a longer life.

However, despite the fact that technology has improved and made the devices more advanced and easier to use, one of the original problems remains, the devices must be plug in into the walls to recharge the devices. Because there is no other way to solve this problem, most individuals accept reality and take extra power with them. Because it is not always possible to recharge the devices everywhere at all times, in this project will created the devices charger that allow us to charge the devices everywhere at any time. People may use this to charge the devices in remote areas when energy is unavailable. The cost of this circuitry may be decreased to the point where the average person could afford to buy it and benefit from it.

The portable solar powered absorbs all of the energy from the sun and uses it power electronic devices. The design quite elegant and sophisticated. The current project will be a solar panel that is environmentally beneficial. Many electrical devices, such as laptops and smartphones can be recharge using the portable solar powered. There are USB charging ports.

1.2 Problem Statement

Solar energy is a technology that is growing in popularity as it becomes more advanced. Solar energy has become more efficient because to advancements in panels and coatings, as well as solar tracking. Solar energy will be used in this project to generate power for an outside charging for the devices.

Attempt to resolve issues such as today's smartphones' limited battery life, the limited availability of AC current from a standard wall charger and other issues that arise in emergency situations. Cell phones are very useful in situations like emergencies, road trips, trekking, blackouts and so on, and also having access to a renewable and sustainable charging source would be extremely beneficial. The solution to this problem is to reduce electricity use by using solar energy. Everything will be greener and the risk of electricity will be lowered. The project's goal is to charge the device with solar energy which then charges the electrical device, reducing electricity use.

1.3 Objectives

The objectives of research are :

a) To design portable solar-powered battery charger.

b) To evaluate the performance and durability of the designed charger.

1.4 Scope of Study

The scope of research are as follows :

a) Solar energy would use to power an outdoor charging station for electronic devices.

b) That the portable solar powered is quite handy because it is both environmentally safe and convenient to use.

c) PV charges are sophisticated devices that can potentially be built in a less efficient and less effective manner.

d) The system will contain the Maximum Power Point Tracking (MPPT) is algorithm that included in charge controllers used for extracting maximum available power from PV module under certain conditions for preventing the overcharging.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

Solar energy is defined as the heat and light energy received from the sun. The Earth receives solar energy in the form of electromagnetic radiation with a wide frequency range. In terms of energy per unit time, available solar energy is commonly stated in watts per square meter (W/m2) or watts-hours per square meter (Wh/m2). The amount of energy accessible from the sun outside the Earth's atmosphere is around 1367 W/m2. (Dunlop, 2012).

The quantity of solar energy accessible at any one time is mostly governed by the sun's location in the atmosphere as well as the amount of cloud cover that exists. The quantity of solar energy accessible on a monthly or annual basis is frequently dictated by location. In general, the quantity of solar energy available, other environmental elements, equipment employed, emissins, geographic location and utilisation influence usable solar energy.

2.2 Solar Energy As A Power Source

Solar cell-based power generation has been growing in popularity for a long time and is quickly becoming a major source of energy in countries on both sides of the equator. Malaysia receives more than 4 hours of consistent sunlight due to its proximity to the equator(Mekhilef *et al.*, 2012). This amount is higher than that of Japan. Solar energy is used by the German and US governments as a renewable energy source. In Malaysia, solar energy

is abundant, making it an ideal power source. Although many green or alternative energy sources have been investigated in the past, energy replacement is not a novel notion (NS Energy Staff Writer, 2021).

Solar photovoltaic (PV) is recognized worldwide as an alternative energy source with high potential(Gielen *et al.*, 2019). Solar energy can be used as a backup power source in the event of a power failure. PV is one of the fastest growing and most promising renewable energy sources for power generation(Sciences, Engineering and Academies, 2010).

2.2.1 Solar As A Benefits

Solar cells or photovoltaic systems can be used in a variety of ways. For applications in aerospace, electric cars, communication devices and remote motor propulsion, solar cells have been used to charge a variety of solar batteries. PV systems can be uesd for a variety of things, including water pumping, full electrification of rural settlements, multi-load power and satellite power systems. Solar energy is utilised in Malaysia for a range of uses, including heating, lighting and other agricultural needs, as well as for variety of distant and urban applications.

The use of solar energy as an energy source offers many advantages. Due to its innovative and distincitive conversion mechanism, photovoltaic has proven to be new and exciting energy source. The photovoltaic system has no moving parts that can break, no liquid or gas leaks outs and can function at moderate temperatures. In addition, the system does not require fuel, which makes it an environmentally friendly, responsive and virtually maintenance-free energy source. Solar energy has a lower environmental impact than other traditional energy sources that generate toxic pollutants.

On the plus side, photovoltaic arrays can be made of silicon, a common semiconductor element found on the planet. New genarations of consumer portable solar

arrays are being developed as aresult of recent technological improvemnets in thin-film photovoltaics, including B. Amorphous silicon and hybrid sensitized/photovoltaic (PV) cells(Zhang *et al.*, 2018). The new array is light, strong and adaptable, with an energy efficiency of up to 10%(Li *et al.*, 2021).

2.3 Solar Cell

A solar cell, also called a photovoltaic cell, is a device that use the photovoltaic effect to convert light energy directly into electrical energy. The majority of solar cells are constructed of silicon, which has improved in efficiency and cost as materials progressed from amphora (non-crystalline) through polycrystalline and crystalline (single crystal) forms to silicon. Solar cells, unlike batteries or fuel cells, do not employ chemical processes to create energy and do not require fuel. They also have no moving components unlike electric generators (Ashok, S., 2017).

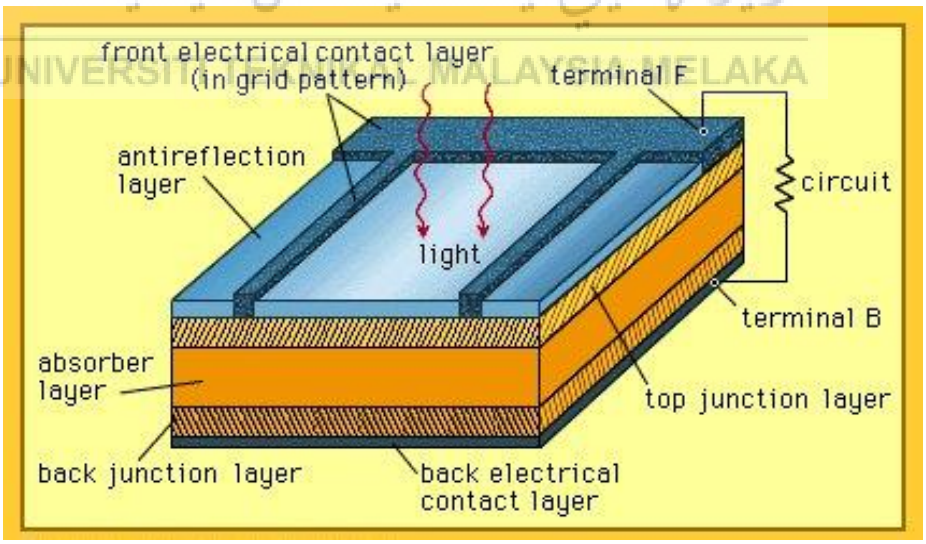

Figure 2.1 Solar cell structure (Ashok, S., 2017)

Solar cells can be put together to form arrays, which are enormous groups of cells. This array, which consists of ten of thousands of individual cells, can serve as a central power

station, converting sunlight into electricity and distributing it ti ondustrial, commercial and residential users. Solar cells in much smaller shapes, known as solar cell , have been installed on the roofs of residences as an alternative or supplement to their conventional enery supply. Solar panels are utilized to generate electricity in many distant regions when traditional enery sources are unavailable or too expensive.

Solar cells power most space installations, from communications and weather satellites to space stations, because they have no moving parts to maintain or fuel to recharge. Solar cells are used in consumer electronics such as electronic toys, calculators and portable radios. These gadgets' solar cell can work with both natural and artificial light(eg from incandescent and fluoresent lamps).

While total photovoltaic energy production is now insignificant, it is expected to grow as fossil fuel resources become scarce. In fact, calculations based on estimates of global energy use through 2030 imply that solar panels operating at 20% efficiency and covering only 496,805 square kilometers (191,817 square miles) of the Earth's surface can meet the world's energy needs(Ashok, S., 2017). Since silicon is the second most requirement will be enormous, but achievable. These considerations have prompted solar proponents to anticipate a future "solar economy" in which cheap, clean, renewable sunlight will meet nearly all of humanity's energy needs.

Light can be reflected, absorbed or transmitted directly as it strikes a photovoltaic (PV) cell, as known as solar cell. Semiconducting materilas, which conduct electricity better than insulators but not as wells as metals, are used in PV cells. PV cells are constructed from a variety of semiconductor materials. When a semiconductor is exposed to light, it absorb the energy and transfer it to electrons in the material, which are negatively charged particles. This increase in energy permits electrons to flow as an electric current through the material.