SOLAR BASED CONTROLLING OF TUBE LIGHT USING TESLA COIL

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ABSTRACT

Electricity is required in every industry. A major part of electricity is produced using thermal, hydropower. Now a day, people are moving towards the usage of solar energy to produce electricity due to a lack of resources. Electricity is transferred from one place to another (i.e. Producing station to households) through high tension. This process requires a lot of human effort and materials because of the long wires and height poles. During heavy rains, the breakage of these lines leads to long hours of a power outage and sometimes leads to the death of living beings. Our model is the solution for the above. In our model, we use solar panels to produce electricity from solar energy and a tesla coil to transmit power. Light is the main component used everywhere. The solar panels make the current flow through the tesla coils which create an electromagnetic field. This will make the tube light glow. The battery is used to store energy for the time when solar energy is not present (i.e. nighttime). The tube lights can also be operated by using the remote. The main objective of this model work is to study and implement the Technology of "Wireless Power Transmitters" (WPT).

Keywords: Solar Energy, Tesla coil, Wireless power transmission, Microcontroller

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1 INTRODUCTION

The deficiency of nonrenewable like coal is showing a great impact on the production of electricity. The electricity generated from hydropower is having its drawbacks during the summer season. Passing electricity from the generation station to every household and industry is very challenging as it requires lengthy transmission lines. These all issues are emerging us to look for alternative sources from the production of electricity and transmission from one place to another. So we need to find a solution for all the mentioned problems. Sun is an everlasting energy provider to the earth. Solar energy is a renewable resource so we can use it to produce electricity. Wireless transmission of power can be adapted to reduce the cost and resources used for power transmission. In this paper, we will discuss a model that is capable of converting solar energy into power and the transmission of generated power using the tesla coil.

Without using specially designed conductors, wireless power transfer involves transferring electrical energy from a power source to a consumer product (WPT). [2] It serves as a general term for several time-varying electromagnetic field-based power transmission methods. Electrical energy will be transmitted up to a specific distance in the air around the tip of the secondary coil utilising a pulsing air core transformer switching at high frequency. With the help of this type of energy transfer, any electrical equipment brought inside the range of the electric field, such as CFL (Compact Fluorescent Light) lamps or Fluorescent Tube Lights, will shine automatically without the use of any conducting wires. Solar energy is used to generate the current that is required for the tesla coil to produce electromagnetic fields.[1] And the circuit is operated by a remote made of the microcontroller.

2 LITERATURE SURVEY

The paper “Wireless Power Transmission; An Overview of Technological advancements" written by Bablu Kumar Singh, Komal Sharma, and Jyoti Lodha discusses the outline of recent research and advancements in the field of wireless electricity transfer. Wireless power transmission methods like Laser beaming and microwave power transfer are discussed. It also explains solar and magnetic resonant induction coupling. In this paper, they also discussed the future of wireless power transmission and outlined its several benefits. This document aids us in fully comprehending the alternate approach to energy transmission [1]. Dharani. M, Dr Ravi. K wrote the paper "Systematic Literature review on wireless Power Transmission". It discusses the various wireless power transmission techniques. It gives the basic idea about the radiative and non-radiative power that can be transmitted wirelessly. It also discusses the origin and emerging wireless technologies [2]. The paper "Analysis and implementation of wireless power transfer using Tesla coil" was written by Bhavana G Patgar, Savitha P R, Anand B R, Joshua Philip Mathew, and Aishwarya G Shetty. It discusses the technique involved in wireless power transmission using the tesla coil. The authors discussed the glowing of the fluorescent bulb by using a tesla coil [3]. The paper "Design of Tesla Coil" by Rupesh S. Urwade, Hitesh Patil, Ashwini Parit, and Swarada Muley discusses a novel method for designing tesla coils. The design proposed in this paper is capable to generate high-frequency current and high voltage on the secondary side and is recommended for advanced investigations, notably on the evolution of wireless energy [4]. The article, "A Study On Wireless Power Transfer Using Tesla Coil Technique," was written by Ahmad Lukhfhy Abd Razak, Mohd Izhar Abu Bakar , Pusparini Dewi Abd Aziz, and Nulida Ab. In this paper, they discussed the process of glowing the fluorescent bulb using the tesla coil. They experimented by using 450, 600, and 900 turn coils and observed the brightness of the light at various distances. They observed that 900 turn coil is capable of giving more brightness to longer distances compared to others [5]. The fundamentals of solar energy are covered in the essay "A Review Paper On Electricity Generation From Solar Energy" by Anil Tekell, Suvarna Labade, and Mohd Rizwan Sirajuddin Shaikh. In this paper, they also discussed the working of solar panels, and types of solar panels [6]. The article "A Simple Design Of A Mini Tesla Coil With Dc Voltage Input" was written by J.M. Herman , M.S. Yahaya, A. Din, A.A. Rahman, and M. B. Farriz. They spoke about their Tesla coil model in this publication. Its construction is similar to a typical Tesla coil in that it can generate medium voltage with a high-frequency current at the secondary circuit. In this design, there is no alternating current voltage at the input. It just needs a small quantity of direct current to operate. Voltage serves as the primary circuit's input. According to the study's Pspice simulation, the suggested design was capable of at least fifty times the input voltage increase in energy and voltage at the secondary level winding, among other requirements. Further research should be done on the Tesla coil miniature suggested in this work. especially the development of wireless energy [7]. Ashardi Abas and Abu Bakar Ibrahim's article is titled "Design of A Microcontroller Based Rf Remote Control For Stepper Motor Control". In this paper, they discussed how to control Stepper Motor with the remote using the 89c2051 microcontroller. They used the microcontroller at the receiver and transmitter to pass the signals [8]. Temitope A , Adedayo B, Kehinde O, Ayodele SO and Ezea H describe how users may utilise IR control to open and close the gate using a password in their article, "Design of Automatic Gate Control Using Infrared Remote with Password Protected Features". This gate's associated device is managed by an assembly language-programmed microcontroller with a logic circuit. This activity is controlled by an AT89C2051, an 8-bit microcontroller, which receives an infrared signal from the transmitter through an infrared sensor, decodes it, and activates the relay that manages the DC motor, which contains gear that guides the gate's forward and backward movement. [9]. Ilgaitis Prusis, Peteris Prusis wrote the paper with the title “Quantum Entanglement and Multispace Conception”. In this paper they discussed about the quantum entanglement. According to their theory if two electrons with common electrical eigen space are introduced in gravitational space they get entangled and nothing changes in their electrical eigen space even though they move in the gravitational space. They proposed that energy transmission can also possible wirelessly with the theory of quantum entanglement[11].

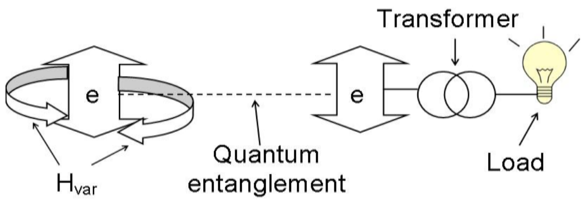

Fig.1. Quantum entangled power transmission

3 COMPONENTS REQUIRED

3.1 Solar Panel

A group of photovoltaic cells set on a framework makes up a photovoltaic (PV) module, sometimes referred to as a solar panel. Solar panels generate direct current (DC) power by using sunlight as an energy source. [10]. PV modules make up PV panels, whereas PV panels make up PV arrays. Solar energy is converted into electrical energy via photovoltaic arrays [6]. We utilised a 12V-0.8 Amp solar panel in our simulation. Power produced at full sun is equal to VxI = 12x0.8 = 9.6W.

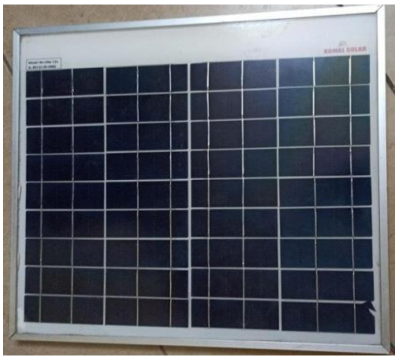

Fig.2. Solar panels

3.2 Rechargeable Battery

Solar energy is not always available so we need backup power to operate the light at all times. So we use rechargeable batteries to store energy. A rechargeable battery, storage battery, or secondary cell (technically a type of energy accumulator) can be charged, discharged into a load, and recharged numerous times, as opposed to a disposable or main battery, which is supplied fully charged and discarded after usage. In this model 12V-4Ah, a rechargeable battery is used. Figure 3 is the picture of two rechargeable batteries used in this model for the two-tesla coils. Battery Charging Time =Battery Rating/Charging current =4/0.8 = 5Hrs. Battery Backup time =Battery Rating/Current consumption of the system =4/3 =1.33Hrs

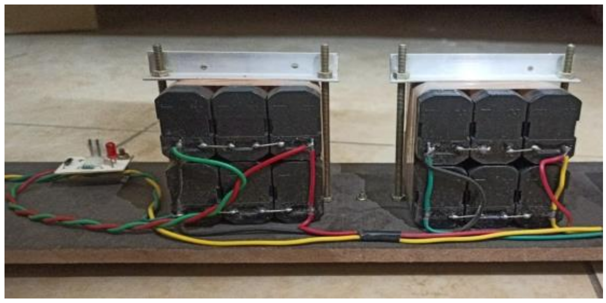

Fig.3. Rechargeable batteries

3.3 Oscillator Circuit

A self oscillator with a high-frequency switching transistor is employed in this model. The circuit creates a frequency of 30 kHz. A base biasing resistor is connected between the base and Vcc. Because the negative potential of the Tesla coil is linked to the source base, the transistor will be de-energised. The base biasing resistor will always try to energize the transistor, while the tesla coil's zero point will always try to de-energise it. The transistor oscillates at a high frequency of 30 kHz in this sequence**.**

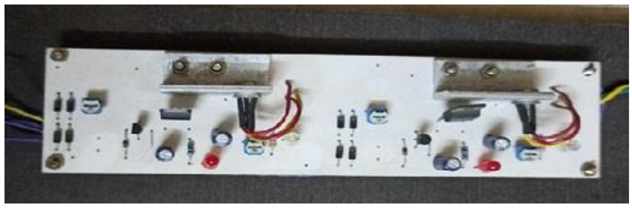

Fig.4. Oscillator Circuit

3.3 Tesla Coil

A Tesla coil is a type of resonant electrical transformer circuit that was created by Nikola Tesla in 1891. It produces alternating current with high frequency, low current, and high voltage. In our model, each tesla coil is having 2 independent primaries with the help of 2 independent oscillator circuits. Both primaries are driven simultaneously to enhance the radiating power of the tesla coil [3] Figure 5 is the picture of one primary and secondary coil**.** Each primary is having 4 turns and 12V is applied. Therefore turn per volt =12/4 =3 volts. The secondary coil would be 200 turns. Therefore 3x200=600 volts. This means each tesla coil generates 600 volts of electromagnetic waves and they are radiated into the air. The current produced by the tesla coil is negotiable. It is not harmful to human bodies. Even though proper care while experimenting and avoiding

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physical contact with all the components while operating [4]

Fig.5.Tesla coil with primary and secondary windings

3.4 RF Modules

A radio frequency module (RF module) is a tiny electrical component that allows two devices to exchange radio signals. In embedded systems, wireless connection with another device is usually desired. This wireless communication might be done via radio frequency (RF) transmission [7] Because it does not need a line of sight, RF is the chosen medium for many applications.

3.5 89c2051 Microcontroller Chips

The AT89C2051 is an 8-bit CMOS microcontroller with 2K bytes of flash memory that can be programmed and erased (PEROM). The system utilises Atmel's high-density nonvolatile memory technology and is compatible with the MCS-51 instruction set. [8]. The Atmel AT89C2051 is a potent microcomputer that integrates Flash and an 8-bit CPU on a single monolithic chip to provide a highly adaptable and economical solution for a variety of embedded control applications.

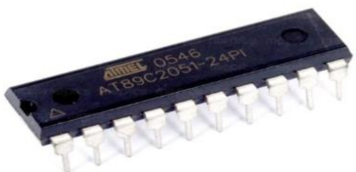

Fig.6. 89c2051 microcontroller.

3.7 Relay

A switch that is turned on or off by electricity is called a relay. In addition to a set of input terminals for one or more control signals, it features a set of functional contact terminals. On the switch, there may be a variety of connections in various contact shapes, such as break contacts.

4 Working

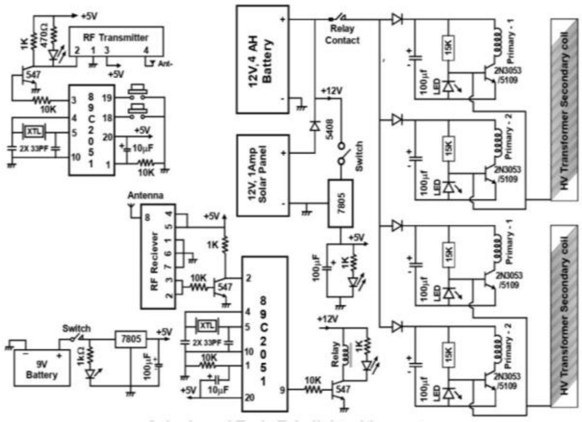

Fig.7. Circuit Diagram

The components are arranged as per the above circuit diagram. The working of the model starts with the solar panels.

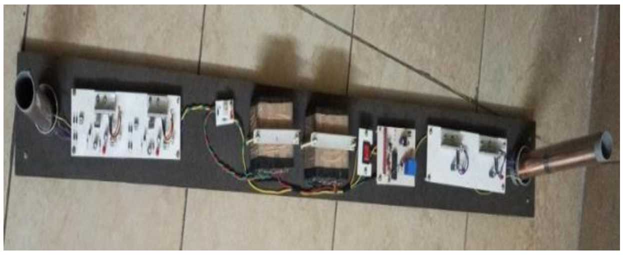

Fig.8. The arrangement of all the components

The solar panels are placed in the sunlight and are connected to rechargeable batteries. We have a relay to control the operation of the circuit. The solar panels are connected to rechargeable batteries. The solar energy will be stored in the rechargeable batteries and some of the energy will be passed to the oscillatory circuit. The oscillatory circuit converts the dc power into ac power and passes it to the primary coil. The current in the secondary coil is induced by the magnetic field produced by the current in the main coil. [5] The secondary coil's voltage will be higher than the primary coil's voltage since the secondary coil has more turns than the primary coil. The generated nonradiative field causes the mercury vapour in the fluorescent light to energise which leads to the glowing of the bulb. The entire circuit can be operated by the remote made of 89c2051 microcontroller. The transmitting antenna is placed at the remote and the receiving antenna is placed at the tesla coil circuit. Both the antennas operate at the same frequency [9]

Because of the rechargeable batteries the lights can be used at night times.

5 RESULT

When there is proper sunlight or the presence of charge in the batteries and the circuit is on then the current passes through the coils. When we place the fluorescent lights at a radius of 2-3 feet the light glows. When the light is moving away from the tesla coils the brightness gradually decreases and finally goes off. The figure shows the working of the light without any wired connections.

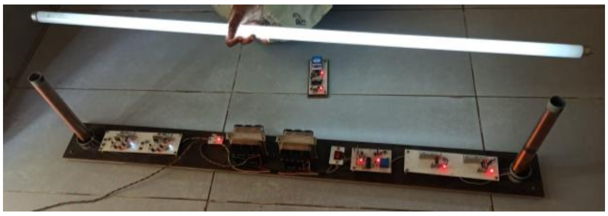

Fig.9. Working of the model

6 CONCLUSION AND FUTURE SCOPE

Light is an important device in all places. Implementation of wireless power transmission at the domestic level leads to saving a lot of electricity. It also reduces the wired connections. Usage of solar energy increases the better chances for renewable resources. This model can be further expanded for large battery backup hours and transmission of power with the quantum entanglement instead of tesla coil. With the implementation of quantum theory in wireless power transmission losses can be reduced and transmission becomes easier. Shifting to wireless power transmission not only reduces the complexity of transmission of electricity but also helps in promoting the usage of non-renewable resources and reducing expenses.

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