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WIRELESS POWER TRANSMISSION USING TESLA COIL (MOBILE CHARGING)

A MINOR PROJECT- I REPORT

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BACHELOR OF ENGINEERING

in

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

M.KUMARASAMY COLLEGE OF ENGINEERING

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BONAFIDE CERTIFICATE

Certified that this **18ECP103-Minor Project I** report "WIRELESS POWER TRANSMISSIO USING TESLA COIL**"** is the bonafide work of **ASVINAA R M (927622BEC018), DHARANIYA V (927622BEC034), DHARSINI B (927622BEC041), FARZHANA R (927622BEC049) "who** carried out the project work under my supervision in the academic year 2023-2024 -ODD.

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PROJECT COORDINATOR

INSTITUTION VISION AND MISSION

Vision

To emerge as a leader among the top institutions in the field of technical education.

Mission

M1: Produce smart technocrats with empirical knowledge who can surmount the global challenges.

M2: Create a diverse, fully -engaged, learner -centric campus environment to provide quality education to the students.

M3: Maintain mutually beneficial partnerships with our alumni, industry and professional associations

DEPARTMENT VISION, MISSION, PEO, PO AND PSO

Vision

To empower the Electronics and Communication Engineering students with emerging technologies, professionalism, innovative research and social responsibility.

Mission

M1: Attain the academic excellence through innovative teaching learning process, research areas & laboratories and Consultancy projects.

M2: Inculcate the students in problem solving and lifelong learning ability.

M3: Provide entrepreneurial skills and leadership qualities.

M4: Render the technical knowledge and skills of faculty members.

Program Educational Objectives

PEO1: **Core Competence:** Graduates will have a successful career in academia or industry associated with Electronics and Communication Engineering

PEO2: **Professionalism:** Graduates will provide feasible solutions for the challenging problems through comprehensive research and innovation in the allied areas of Electronics and Communication Engineering.

PEO3: **Lifelong Learning:** Graduates will contribute to the social needs through lifelong learning, practicing professional ethics and leadership quality

Program Outcomes

PO 1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO 2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO 3: Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO 4: Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO 5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO 6: The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO 7: Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO 8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO 9: Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO 10: Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO 11: Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO 12: Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Program Specific Outcomes

PSO1: Applying knowledge in various areas, like Electronics, Communications, Signal processing, VLSI, Embedded systems etc., in the design and implementation of Engineering application.

PSO2: Able to solve complex problems in Electronics and Communication Engineering with analytical and managerial skills either independently or in team using latest hardware and software tools to fulfil the industrial expectations.

Abstract	Matching with POs,PSOs
Tesla coil, Transmitter, Wireless	**<<PO1, PO2, PO3, PO4, PO5, PO6,PO7, PO8, PO9, PO10, PO11, PO12, PSO1, PSO2>>**

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ABSTRACT

This paper intends to present the design of wireless charging using the Tesla coil. There are two methods of electrical energy transmission - 1) is wired, and 2) is wireless. Wired electric transmission is much complicated in design. An easy way to overcome this disadvantage is to use wireless transmission. This project explains how the electrical energy is transferred from a charging source to the receiver, without any wired physical connection. In this proposed work, two coils are used; one is primary, and another is secondary, induction principle is used, which creates the magnetic field. The Tesla coil can be used as a transmitter. This paper proposed a simple and straightforward design which does not have ac voltage at the input. Keywords: Tesla Coil, Transmitter, Wireless

TABLE OF CONTENTS

LIST OF FIQURES

CHAPTER 1

INTRODUCTION

The standard method of transferring electric energy is by using cables and wires. However, this conventional way is insufficient, messy and has no robustness. The daily use of electronic appliances increases the use of cables which creates a complicated connection in daily life. The solution to this problem is wireless energy transfer. Air is the only available media to transfer energy. A Tesla coil is an air-core resonant transformer which generates a very high frequency, high voltage, and low alternating current. In 1891, Nikola Tesla, a Serbian-American inventor, electrical engineer, and a mechanical engineer unveiled one of his most famous inventions, the "Tesla coil," a high-frequency transformer capable of creating very high voltage at low current. Tesla invented his coil to transmit electricity through air. He purposed using a few coils spread across the globe to transmit electrical energy through the earth. Wherever power was needed, one would need only a receiving coil to convert power into a useful form. Modern Tesla coil also uses a spark gap as well as Transistor or Thyristor to drive resonant transformer. Nikola Tesla started efforts on wireless transmission in 1891 at his “experimental station” at Colorado [4]. A small incandescent resonant circuit, grounded on one end was successfully charging.

1.1 OBJECTIVE

Project intends to present the design of wireless transmission of electric energy over a short distance, allowing it to access energy light in a particular place. This project explains how the electrical energy is transferred from a charging source to the receiver without any wired physical connection. It reduces the work of wired modules and gives aesthetic appearance.

CHAPTER 2

LITERATURE REVIEW

1."Wireless Power Transfer Using a Tesla Coil and the E-Iron Power Supply,2020."

In this paper by J.-C. N. Brito and H. C. Ferreira Allows uniform distribution of voltage throughout the winding coils. It also Builds up the voltage at a slow pace. It showed Great performance in great speed. Though it produced great result it gave huge power loss and energy dissipation.

2."Notes on Tesla Coil Design and Power Transfer Performances,2020."

In this paper, by Zoran blezaric revisit the Tesla Coil, a device that had the pivotal Role in the development of radio. The analysis is conducted on the basis of the antenna theory, and the feasability for its applications to wireless power transfer is tested by experiment. It is shown that Tesla coil can very well be used for an efficient transmission of electrical energy without wires at small and mid-ranges.

3. "Wireless Energy Transfer Using a Tesla Coil System,2021."

In this paper, by R. M. R. Leandro, E. P. de Freitas, and J. B. Vieir had a advantage of simplified voltage transmission with high frequency. Due to it's high voltage transmission it possesses high safety hazard and needed protective equipment. It possessed safety risks, including shock hazards, fire hazards and interference with electronics devices

4."Wireless Power Transfer using Tesla Coils for High-Q Resonant Coupling,2022."

In this paper, by W. Eberhardt S. Hackworth, and K. W. J. Siu gave a advantage of Long-Range Power Transfer with Increased Efficiency Tolerance to Misalignment Higher Power Transfer Capability. The restricts was practical applications to small scale setups and limits the range over which power can be transmitted effectively.

5."Analysis and Comparison of Wireless Power Transfer Using Tesla Coil And Magnetic Resonant Coupling Techniques,2020."

In this paper, tesla coil and magnetic resonant proposed by

P.Thongcharoen and T.O.Ting, transferred electric current to longer distance and it also had unique aesthetic appeal. Though the project was aesthetic appealing it possessed safety risks, including shock hazards, fire hazards and interference with electronic devices.

CHAPTER 3

3.1 EXISTING SYSTEM

UNINTERRUPTIBLE POWER SUPPLY(UPS)

An uninterruptible power supply (UPS) is a device that maintains power in the event of a failure. A UPS commonly includes a battery that is kept charged and ready. When power fails, the battery supplies power, as long as it lasts. When the battery fails, a UPS may contain circuitry that triggers an orderly shutdown.

Fig:3.1 UPS

WORKING

The Offline UPS is the simplest one of all types. the load is normally supplied power from mains AC supply. The AC supply is also used to charge the battery bank. The battery is used to feed DC power to the inverter; for converting it to AC supply. When the mains supply fails, the switch will automatically cut off power from it and supply power to the load from the inverter circuit. The switching time

is usually around 25 milliseconds. This type of inverter is the least expensive one, because the main issue is the large switching time.

3.2 PROPOSED SYSTEM

The proposed system of wireless power transmission utilizing Tesla coil technology is to Revolutionize the way electrical energy is delivered without physical connections. The primary circuit, consisting of an AC power supply, capacitor bank, and primary coil, it generates a high-frequency alternating current that is connected to the primary coil. The secondary circuit includes a secondary coil, tuning capacitor and the load to be powered where the secondary coil resonates with the primary circuit, resulting in efficient power transfer through electromagnetic induction. Rectification and regulation circuits convert the received alternating voltage into stable DC power for the load or device. The safety measures such as isolation transformers and protection mechanisms, along with efficiency enhancement techniques, the proposed system offers a convenient and efficient solution for wireless power transmission.

CHAPTER 4

PROBLEM STATMENT

Efficiency Optimization: The efficiency of energy transfer in Tesla coil-based wireless power transmission systems is a critical challenge. Investigating and enhancing the efficiency of power transfer over various distances will be a focal point. This includes minimizing energy losses during transmission and maximizing the delivered power to the receiving end.

Safety Considerations: Ensuring the safety of both the transmission system and surrounding environments is paramount. Addressing potential electromagnetic interference, health concerns, and designing fail-safe mechanisms are vital components of the research problem. This involves evaluating electromagnetic field exposure levels and implementing safeguards to meet regulatory standards.

Distance and Scalability: Examining the transmission range and scalability of Tesla coil systems is essential. Identifying the limitations in terms of distance over which efficient power transmission can occur and exploring methods to extend this range will be part of the research focus.

Adaptability to Various Applications: Understanding the adaptability of Tesla coil-based wireless power transmission to diverse applications is crucial. Investigating its feasibility for powering electronic devices, electric vehicles, or even remote sensors will contribute to expanding the practical utility of this technology.

Integration with Modern Technologies: Exploring the integration of Tesla coil technology with contemporary devices and power systems is a key challenge. Compatibility with existing power infrastructure, grid integration, and smart

technologies should be considered to ensure seamless integration with current and future energy systems.

Addressing these challenges in the problem statement will guide the research towards developing practical and efficient wireless power transmission systems using Tesla coil technology, ultimately contributing to advancements in sustainable energy solutions.

CHAPTER 5

PROJECT METHODOLOGY

In this project the current is transferred wirelessly from one coil to other and this can be done with a adapter connecting with the switchboard in other way it can be connected with battery.

The charging pin is connected with the circuit, so the charging cabled can be inserted with it and the mobile can be chargeable.

5.1 BLOCK DIAGRM

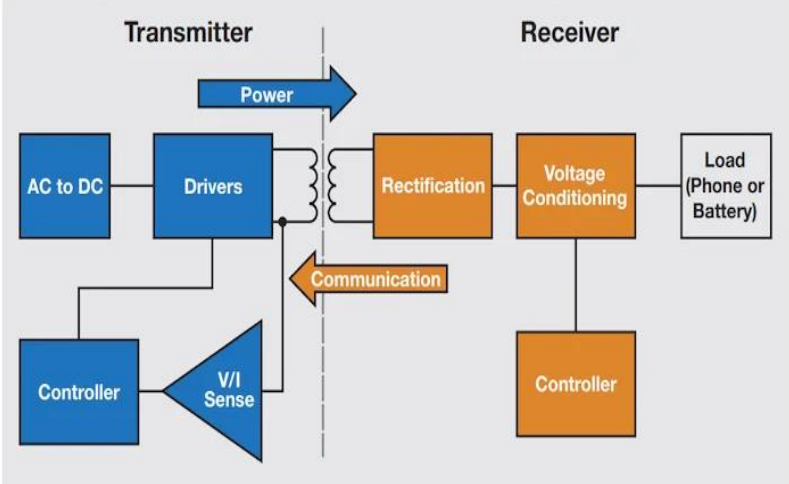

Fig:5.1 Block Diagram

CHAPTER 6

WORKING PROCEDURE

- Power from the battery reaches the resistor. Resistor regulates the current which then passes to transistor. The transistor transfers the power to primary coil. Primary coil and secondary coil together induce electric current.
- A mini-Tesla coil operates based on the principles of electromagnetic resonance and high-frequency oscillation. It consists of two main components: a primary coil and a secondary coil.
- The primary coil is connected to a power source that generates high-frequency alternating current (AC). This current creates a changing magnetic field around the primary coil.
- The changing magnetic field induces a voltage in the secondary coil through electromagnetic induction. The secondary coil is wound around the primary coil and has many more turns.
- This causes the voltage induced in the secondary coil to be much higher than the voltage in the primary coil.
- As a result, a high-voltage, high-frequency AC is generated at the top of the secondary coil. At the top of the secondary coil, there is a terminal called the "top load" or "spark gap." This terminal accumulates the high voltage and ionizes the air around it.
- When the voltage becomes high enough, it creates a spark, which is the iconic visual effect of a Tesla coil. The spark discharge from the top terminal accompanied by a resonating electrical field that can create various effects, such as Mobile charging wirelessly.

6.1 HARDWARE COMPONENTS

6.1.1 COPPER WIRE

Fig.6.1.1

A copper enameled wire or copper wire is used to make a coil with same radius to transmit the power from one copper coil to another copper coil. Here we use a mini tesla coil to transmit power.

6.1.2 RESISTOR

Fig.6.1.2

In this circuit there are three resistors connected to it, these resistors were connected to it to control the flow of current in the circuit. The resistors connected are 76k ohm,10k ohm, 20k ohm.

6.1.3 DIODE

Fig.6.1.3 Here we use two diodes in the two diodes in the circuit. The diode used here is D4148, D4007.

6.1.4 TRANSISTOR

Fig.6.1.4

The circuit has a8 pin IC chip of NE555P is connected to it. The transistor is used to amplify or switch the electrical signals given to the circuit as input.

6.1.5 CHARGER CONNECTOR PIN

Fig.6.1.5

The charger cable pin adapter is connected to connected the charging cable to the circuit and it is connected to the phone to charge the phone.

6.1.6 TRANFORMER

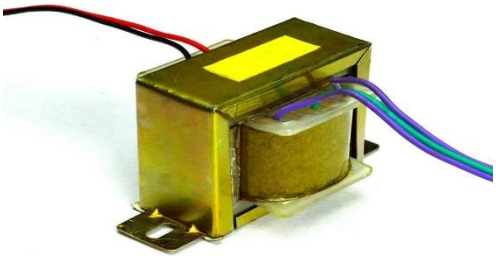

Fig.6.1.6

A step-down transformer is used in the circuit with the primary coil and secondary coil is connected to increase the voltage supplied to the circuit as input.

CHAPTER 7

Result and Discussion

Wireless Power Transmission Demonstration: Use the mini-Tesla coil to demonstrate wireless power transmission. You could power a small LED bulb or a wireless charging receiver wirelessly from a short distance. But we did only the wirelessly charging receiver and mobile can be charged from a small distance wirelessly, hereby we connected a charging pin to charge the phone using a charging cable. In one minute, it passes 12V.

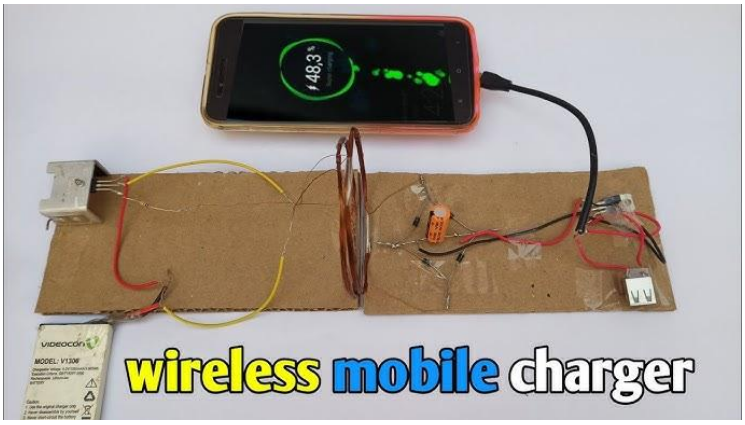

Fig.7.1 OUTPUT

CHAPTER 8

CONCLUSION

The wireless power transmission project using a mini-Tesla coil demonstrates the fascinating capability of transferring electrical energy without direct physical connections. This project proposes the mechanism of wireless power transmission for emergency light and charging. Utilizing the technology of tesla coil for this product is really beneficial because it aids in numerous tasks. It is really important to have access to electricity during outages and breakouts. without having to spend a lot of money and our project addresses that issue. The wireless lights Using tesla coil is more efficient, less energy consuming, environmentally friendly. The project can be used in semi urban and rural areas where electricity is not available without interruption

CHAPTER 9

Future Scope

The future scope for wireless power for lights holds several exciting possibilities. Wireless power could play a pivotal role in powering smart lighting systems. Wireless power enables more flexibility in designing charging installations. Charge could be easily repositioned or relocated without the constraints of wired connections, allowing for adaptable and dynamic charging setups. Wireless power for mobile charge could contribute to sustainability efforts by reducing the reliance on conventional power sources, thereby lowering energy consumption. In remote orchard-to-reach areas, wireless power could provide a practical solution for lighting and charging without the need for extensive wiring infrastructure.

CHAPTER 10

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