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Wireless Vehicle Charging System

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Abstract **- Wireless vehicle charging technology has emerged as a transformative solution, reshaping the landscape of electric mobility. This paper explores the advancements, applications, and future prospects of wireless vehicle charging systems. The technology's core advantage lies in its convenience, eliminating the need for physical cables and offering an efficient, user-friendly charging experience. The installation and working procedures for wireless vehicle charging are detailed, encompassing aspects from technology selection to safety considerations. Notably, the technology's applications span various sectors, including urban mobility, public transportation, residential charging, and smart city initiatives. The paper emphasizes the technology's potential to seamlessly integrate into diverse environments, optimizing the use of urban spaces and contributing to sustainable transportation. Examining the future prospects reveals a landscape of innovation and growth. Anticipated developments include increased charging power and efficiency, standardization efforts for interoperability, integration with smart grids, and the potential for dynamic charging on roads. The rise of autonomous and shared mobility further underscores the pivotal role of wireless charging in shaping the future of transportation. As the global momentum toward electric mobility intensifies, wireless vehicle charging stands as a cornerstone technology, offering a cleaner, more accessible, and sustainable path forward. The synthesis of technological advancements, strategic infrastructure development, and collaborative efforts positions wireless charging as a key enabler for the future of efficient and environmentally conscious transportation systems.**

Keywords: LM555 Timer IC, IRFZ44N MOSFET, Step Down Transformer , Copper Coil , LCD Display, Arduino Nano.

I. INTRODUCTION

Wireless vehicle charging systems, often referred to as Wireless Electric Vehicle Charging (WEVC) or inductive charging, have emerged as a transformative solution for powering electric vehicles (EVs) without the need for conventional charging cables. This innovative technology employs electromagnetic fields to transfer energy between a charging pad or ground-based infrastructure and a receiving coil integrated into the electric vehicle. By eliminating the physical connection between the charging source and the vehicle, wireless charging offers unparalleled convenience, enhancing the user experience and promoting the widespread adoption of electric vehicles.

II. LITERATURE REVIEW

Jithin, Antony & Sasi, Akshath & Jaison, Chris & Bensen, A. & R, Reghuraj. (2023). Staticand dynamic wireless charging system for electric vehicle. Recent Research in Science and Technology. S6-S9. 10.25081/rrst.2023.15.8435. Electrified transportation will help to reduce greenhouse gas emissions and petrol prices. Electrified transportation demands that a wide variety of charging networks be set up, in a user-friendly environment, to encourage adoption. Wireless electric vehicle charging systems (WEVCS) can be a potential alternative technology to charge electric vehicles (EVs) without any plug-in problems. This paper outlines the currently available wireless power transfer technology for EVs. In addition, it also includes wireless transformer structures with a variety of ferrite shapes, which have been researched. WEVCS are associated with health and safety issues, which have been discussed with the current development in international standards. Two major applications, static and dynamic WEVCS, are explained, and up-to-date progress with features from research laboratories, universities, and industries is recorded. Moreover, future upcoming concepts-based WEVCS, such as ‘‘vehicle-to-grid (V2G)”and ‘‘in-wheel” wireless charging systems (WCS) are reviewed and examined, with qualitative comparisons with other existing technology.

Amjad, Muhammad & Farooq-i-Azam, Muhammad & Ni, Qiang & Dong, Mianxiong & Ansari, Ejaz. (2022).

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Wireless charging systems for electric vehicles. Renewable and Sustainable Energy Reviews. 167.112730.10.1016/j.rser.2022.112730. Electric vehicles require fast, economical and reliable charging systems for efficient performance. Wireless charging systems remove the hassle to plug in the device to be charged when compared with the conventional wired charging systems. Moreover, wireless charging is considered to be environment and user friendly as the wires and mechanical connectors and related infrastructure are not required. This paper reviews the methods and techniques used for wireless charging in electric vehicles.

K, Thulasi & Anusudha, K. (2022). Wireless Charging System for E-Vehicles. International Journal for Research in Applied Science and Engineering Technology. 10.1124-1129.10.22214/ijraset.2022.48140. Solar based Wireless Power Transfer [WPT] using the magnetic induction technology which could avoid human from the hazardous accident caused due to the using of cables. By the using of MOSFET switches in the inverter, it creates the output with high frequency improves the efficiency of power transfer between the coils. Due to this creation of output with higher frequency the charging of battery will be very fast and efficient. By connecting the solar panel to the supply battery, it will be charged continuously using this panel. This will helps the users for the non-stop driving. These advances make the WPT very attractive to the electric vehicle charging application in both stationary and dynamic charging. By introducing WPT in electric vehicle, the obstacles of charging time, range, and cost can be easily managed. WPT technology is developing rapidly in recent years. The proposed system is designed specially to give protection to the battery system of the vehicle by auto-cutting off the power to the battery during overload, overcharge and thermal conditions. This will increase the lifetime of the electrical vehicles.

III. BLOCK DIAGRAM

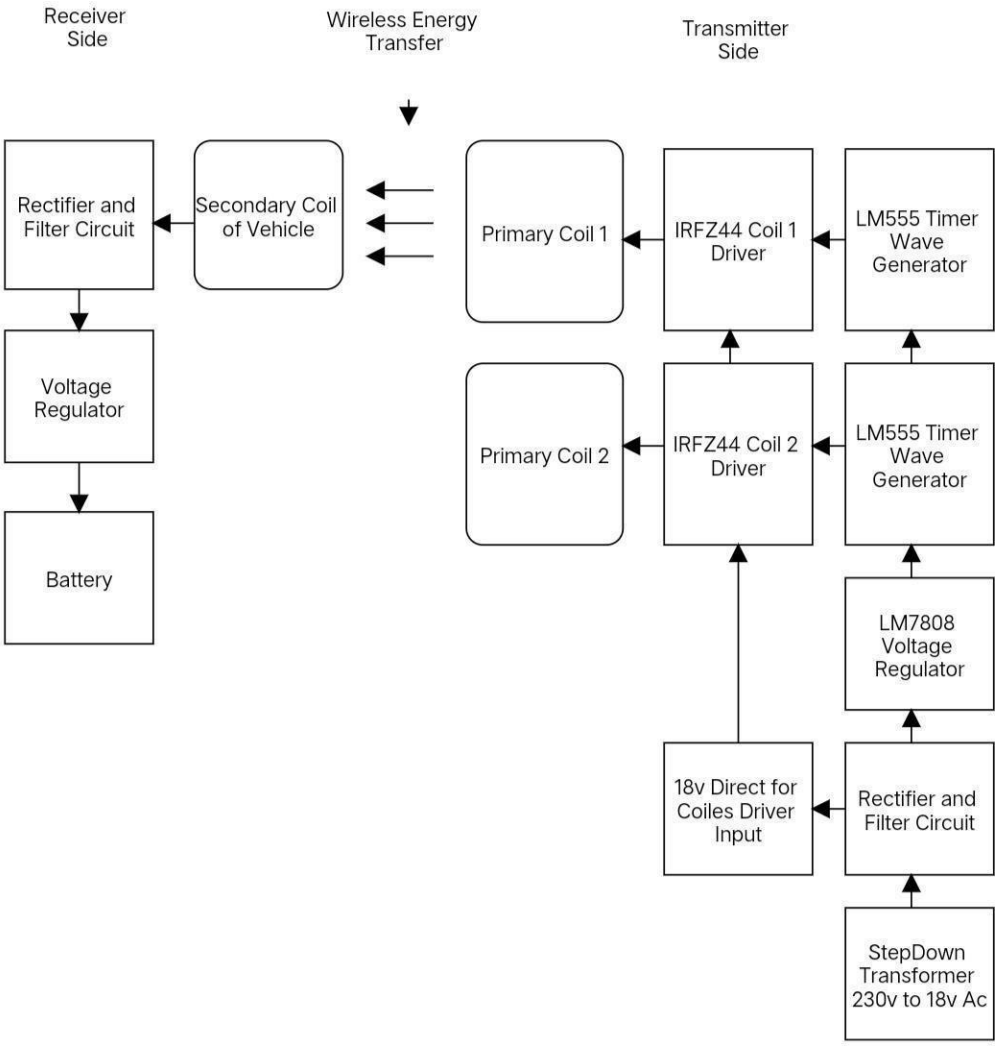

Figure 1: Block Diagram

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Circuit Diagram:

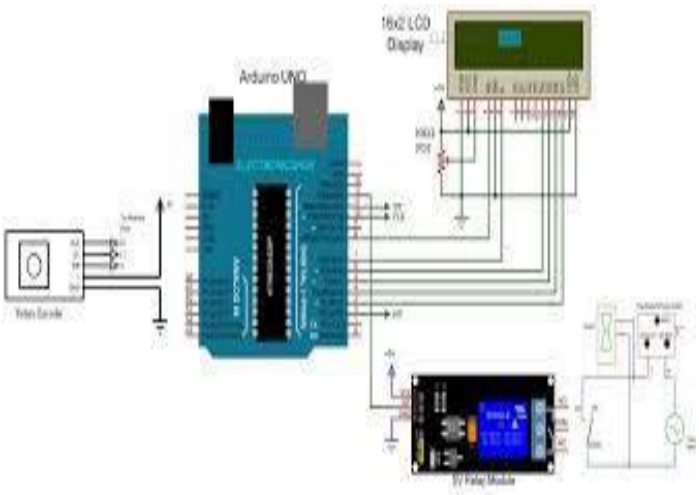

Figure 2: Circuit Diagram

- **Select Charging Technology:** Choose a wireless charging technology suitable for your project. Common standards include Qi wireless charging for low-power devices and proprietary systems for electric vehicles.
- **Choose Components:** Select a wireless charging transmitter (pad) and receiver (installed in the vehicle) that are compatible with your chosen technology and power requirements.
- **Install Charging Pad:** Install the wireless charging pad in the location where the vehicle will be parked for charging. Ensure proper alignment and positioning.
- **Determine Power Requirements:** Determine the power requirements for your electric vehicle and select components that can provide the necessary power levels.
- **Install Charging Receiver in the Vehicle:** Integrate the wireless charging receiver into the electric vehicle. This may involve modifications to the vehicle's power system to accommodate wireless charging.

Project Working Procedure:

- **Park the Vehicle:** Position the electric vehicle over the wireless charging pad in the designated charging area.
- **Automatic Alignment (Optional):** If your system supports automatic alignment, the vehicle should automatically align itself with the charging pad. If not, drivers may need to align the vehicle manually.
- **Charging Initiation:** Once the vehicle is properly positioned, the wireless charging system should initiate the charging process automatically or upon user input.
- **Wireless Power Transfer**: The wireless charging pad generates an electromagnetic field, and the receiver in the vehicle converts this energy back into electrical power to charge the vehicle's battery.
- **Monitoring and Control:** Implement monitoring and control features to track the charging progress, monitor battery temperature, and manage the charging process efficiently.

Figure 3: Final Project

IV. CONCLUSION

In conclusion, wireless vehicle charging represents a transformative and promising solution for the electric mobility landscape, offering a range of advantages and diverse applications. The elimination of physical cables and the convenience of automatic charging contribute to a more user-friendly and accessible experience for electric vehicle owners. The reduced maintenance requirements, enhanced safety features, and seamless integration into various urban and residential environments make wireless charging an attractive option for sustainable transportation solutions.

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