FUTURE VEHICLE CHARGING SYSTEM: AN APPROACH TO ELECTRICAL VEHICLE NAVIGATION

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ABSTRACT

The wireless power transfer is based on a technology called magnetic resonance coupling. Two copper coils are tuned to resonate at the same natural frequency – like two glasses that vibrate when a specific note is sung. The coils are placed a few feet apart. One coil is connected to an electric current, which generates a magnetic field that causes the second coil to resonate. This magnetic resonance results in the invisible transfer of electric energy through the air from the first coil to the receiving coil. The system is also equipped with piezo electric plates for additional power production. All Indian cars are going to be electrical cars by the end of year 2030. Biggest problem with electrical charging is time to charge. Our proposed concept is a technique where bus will be standing on the ramp and all its function will start working from the wireless power transfer unit. Once it's come out of ramp its normal engine based power system will start working. This will make the system more efficient and user friendly. There will not be battery issues. Same concept can be used in the future electric vehicles to charge their batteries on bus stand and public places. Piezoelectric producers are for additional power source.

Keywords: *Wireless Power Transfer, Piezo Electric Plates, Piezoelectric Producers*

1. INTRODUCTION

All Indian cars are going to be electrical cars by the end of year 2030. Biggest problem with electrical charging is time to charge. Our proposed concept is a technique where bus will be standing on the ramp and all its function will start working from the wireless power transfer unit. Once it's come out of ramp its normal engine based power system will start working. This will make the system more efficient and user friendly. There will not be battery issues. Same concept can be used in the future electric vehicles to charge their batteries on bus stand and public places PEVs have been proposed as the prospective mode of transportation to address environment, energy and many other issues. In spite of receiving many government subsidy and tax incentives, EVs have not become an attractive solution to consumers. Major drawback of EV is with the energy storage technology. Short comings of today's battery technology include cost, size, weight, slower charging and low energy density. For example, energy density of commercial Lithium-Ion complete battery pack is around 100 Wh/kg. This value is much smaller than that of gasoline engine. It would be infeasible to achieve range of a gasoline vehicle from a pure PEV with current battery technology.

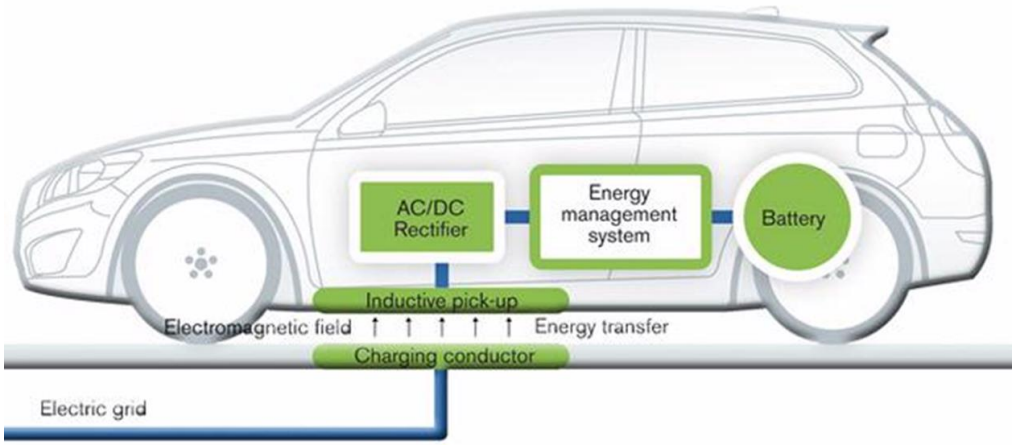


Fig.1.1: Wireless charging schematic

Long charging times and mechanical hassles with charging cables are main drawbacks of present PEV technology that impede the widespread proliferation of PEVs. WPT technology can be used as a solution in eliminating many charging hazards and drawbacks related to cables. The concept of dynamic WPT enabled EVs, which means the EV could be charged while moving in a road will increase the effective driving range while reducing the volume of battery storage. Not only from the consumer perspective, but also from sustainable energy point of view WPT enabled EVs are greatly beneficial. For example, the concept of Vehicle to-Grid to enrich distributed energy generation model can be brought into next stage with WPT facilitated EVs. Some futuristic concepts of motor/ capacitor/WPT EVs have been proposed where EV is continuously charged and possible to run forever without batteries. WPT technology is improving significantly covering aspects such as RF technology, near-field energy transfer, energy conversion and management, energy storage elements, novel materials and fabrication techniques EMC/EMI considerations. However, WPT is yet to fully mature in terms of power transfer efficiency, range, and power rating. Extensive research studies that have been carried out presently would bring the world closer to the futuristic concept of motor/capacitor/WPT EVs.

2. OPERATION

Wireless power transfer is a generic term for a number of different technologies for transmitting energy by means of electromagnetic fields.[11][12][13] The technologies, listed in the table below, differ in the distance over which they can transfer power efficiently, whether the transmitter must be aimed (directed) at the receiver, and in the type of electromagnetic energy they use: time varying electric fields, magnetic fields, radio waves, microwaves, infrared or visible light waves.[14] In general a wireless power system consists of a "transmitter" device connected to a source of power such as a mains power line, which converts the power to a time-varying electromagnetic field, and one or more "receiver" devices which receive the power and convert it back to DC or AC electric current which is used by an electrical load.[11][14] At the transmitter the input power is converted to an oscillating electromagnetic field by some type of "antenna" device.

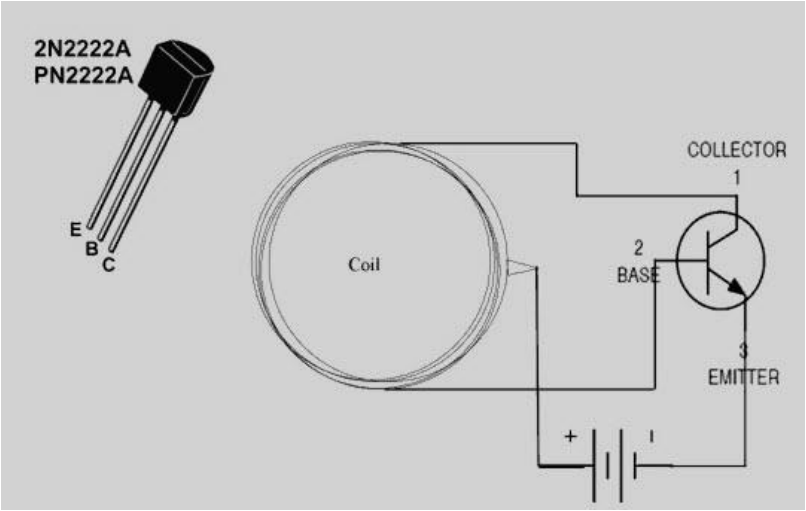
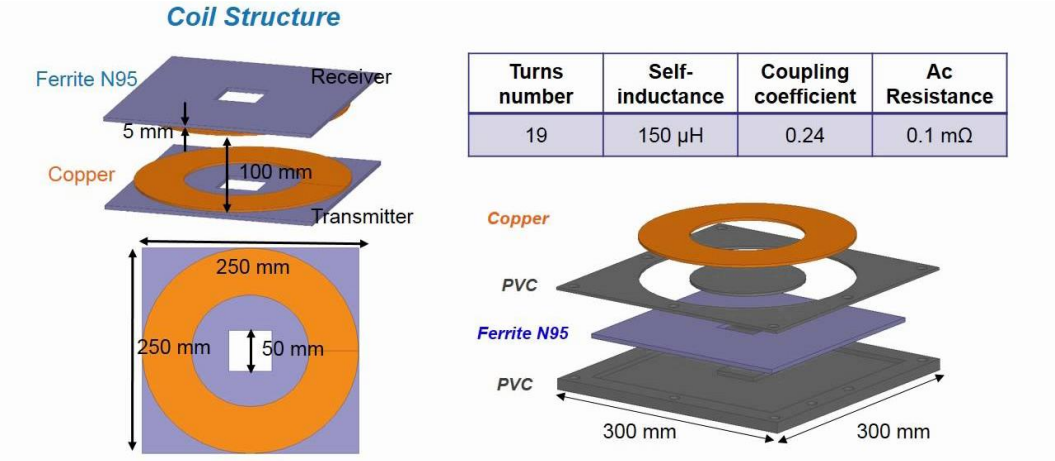


Fig. 1.2: Wireless Charging Schematic

The word "antenna" is used loosely here; it may be a coil of wire which generates a magnetic field, a metal plate which generates an electric field, an antenna which radiates radio waves, or a laser which generates light. A similar antenna or coupling device at the receiver converts the oscillating fields to an electric current. An important parameter that determines the type of waves is the frequency, which determines the wavelength. Wireless power uses the same fields and waves as wireless communication devices like radio,[6][8] another familiar technology that involves electrical energy transmitted without wires by electromagnetic fields, used in cellphones, radio and television broadcasting, and WiFi. In radio communication the goal is the transmission of information, so the amount of power reaching the receiver is not so important, as long as it is sufficient that the information can be received intelligibly.[7][8][5] In wireless communication technologies only tiny amounts of power reach the receiver. In contrast, with wireless power the amount of energy received is the important thing, so the efficiency (fraction of transmitted energy that is received) is the more significant parameter.[12] For this reason, wireless power technologies are likely to be more limited by distance than wireless communication technologies.



Turns number	Self-inductance	Coupling coefficient	Ac Resistance
19	150 μH	0.24	0.1 mΩ

Fig.1.3: Design of Transmitter and Receiver Coil

Wireless power transfer may be used to power up wireless information transmitters or receivers. This type of communication is known as wireless powered communication (WPC). When the harvested power is used to supply the power of wireless information transmitters, the network is known as Simultaneous Wireless Information and Power Transfer (SWIPT);[17] whereas when it is used to supply the power of wireless information receivers, it is known as a Wireless Powered Communication Network (WPCN).[8][9][10]

3. DESIGN METHODOLOGY

Our proposed system is wireless power providing and charging system which is going to be the biggest demand in future soon. We plan to create a system of wireless charging and wireless current providing to running vehicles so that electrical vehicles can also run for longer duration like fossil fuel vehicles.

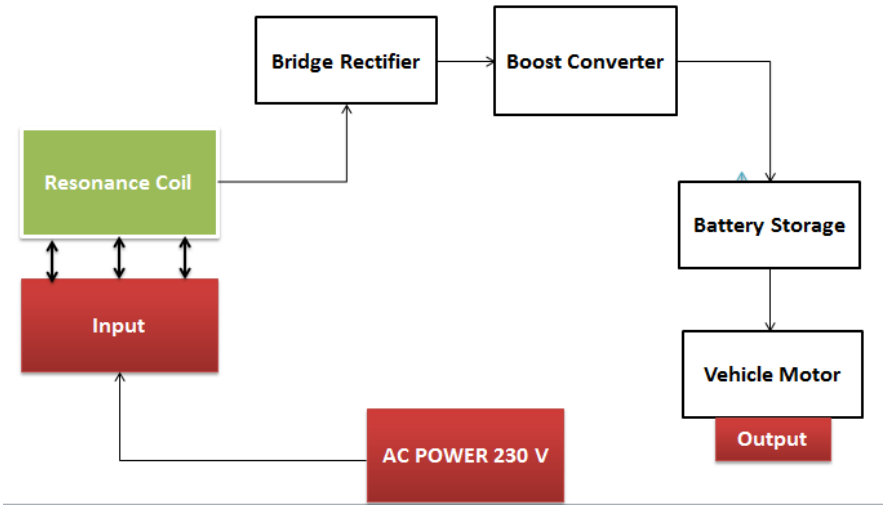


Fig.1.4 : Proposed Block Diagram – Wireless Power Unit

The proposed system for wireless charging unit has been proposed same like above diagram. The system is highly efficient and can be used with higher specification in real-time.

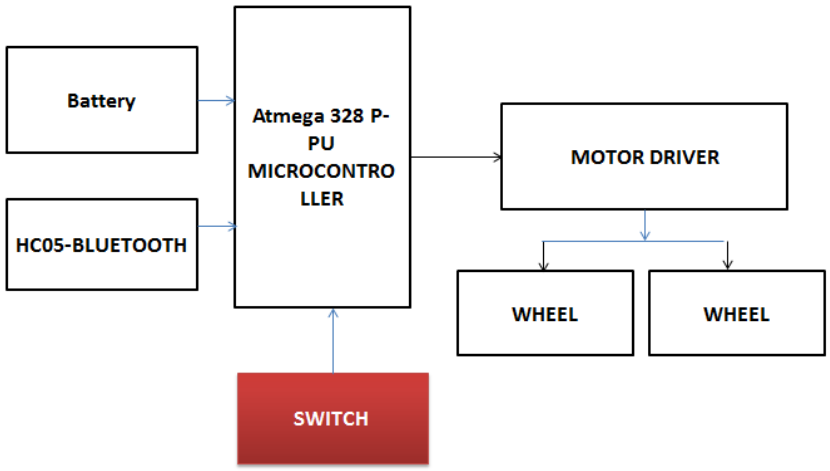


Fig.1.5 : Proposed Block Diagram – Vehicle unit

4. IMPLEMENTATION

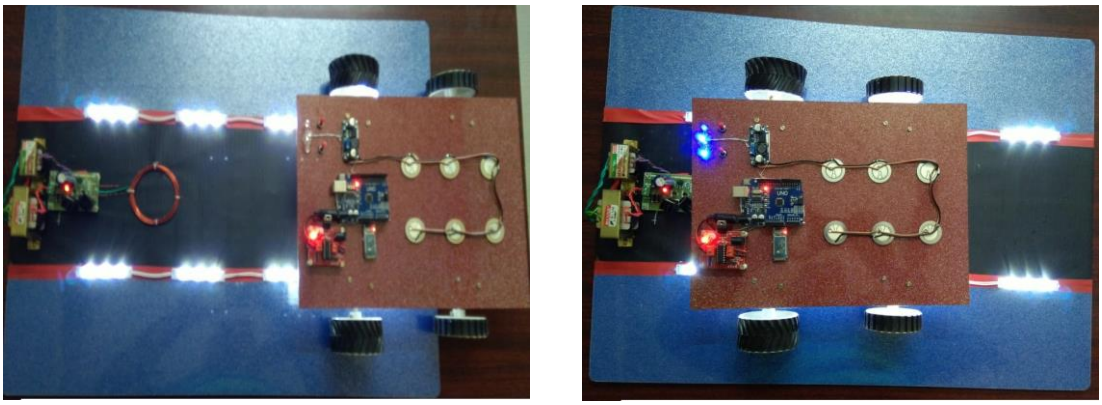


Fig.1.6 : Project Implementation

Acknowledgments

I thank SPECTRUM SOLUTIONS, Pondicherry to help me in creating this paper with his Sincere Guidance and Technical support in the field of power production. I thank my guide Mrs. N. Arthi, HOD/EEE, PRIST University, Pondicherry for her great support. The help of Mrs. N. Arthi, HOD, Department of Electrical and Electronics Engineering, is really immense and once again I thank for her great motivation. I thank PRIST University, Pondicherry for providing me such a standard educational environment so that I am able to understand the minute concepts in the field of Engineering and Technology.

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