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Electric Vehicle Wireless Charging Point

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❖ Abstract :-

1. Wireless power transmission is the way to transfer power without using wire.
2. Wireless power transmission helps to connect those area where people are unable to get a suitable power source.
3. Everyone can get clean and green wireless power. In future all the devices will relate to the power supply source wirelessly.
4. Wireless charging of electric vehicles (EVs) has been in development for several years in preparation for the growth in adoption of these vehicles.
5. Wireless charging systems today offer an efficient, flexible means of charging EVs from multiple classes and at a range of power levels from a common ground source.

❖ Project Objectives :-

To study and investigate on wireless power transfer. A technique used in my research is an inductive resonance coupling method. To identify how many powers voltage and current could transmit from primary coil source to a secondary coil load. To design the wireless power transfer for electric vehicles by using the concept of inductive resonance coupling method. To prove it, a prototype will be built.

❖ Introduction :-

To research innovative wireless charging station technology for electric vehicles. We will discover about the design, construction, and operation of charging stations for electric vehicles from the above case study, as well as the future scopes and requirements of EV charging stations. Wireless Power Transfer (WPT) technique requires no physical contact between vehicle and charging device, therefore overcomes the inconvenience and hazards caused by traditional conductive method. The initial objective is replacing conductive charging method by the novel WPT technology, while maintaining a comparable power level and

efficiency. The long-term goal is to dynamically power the moving vehicles on road. This will lead to a much-reduced battery pack but extended driving range. Then, the main concerns of EV, namely the high battery price and the range anxiety, will be addressed. Wireless power transmission, wireless energy transmission, or electromagnetic power transfer is the transmission of electrical energy without wires. Wireless power transmission technologies use time-varying electric, magnetic, or electromagnetic fields. Wireless transmission is useful to power electrical devices where interconnecting wires are inconvenient, hazardous, or are not possible.

❖ Literature Review :-

1. **K. PARMESHA et.al. (International Journal of Vehicle Structures & Systems-2017), "Wireless Charging system of Electric Vehicle",**

   Wireless power transmission (WPT) is popular and gaining technology finding its application in various fields. The power is transferred from a source to an electrical load without the need of interconnections. WPT is useful to power electrical devices where physical wiring is not possible or inconvenient. The technology uses the principle of mutual inductance. One of the future applications finds in automotive sector especially in Electric Vehicles. This paper deals with research and development of wireless charging systems for Electric vehicles using wireless transmission. The main goal is to transmit power using resonance coupling and to build the charging systems. The systems deal with an AC source, transmission coil, reception coil, converter and electric load which are battery.

2. **ABINAND D et.al. (International Research Journal of Engineering and Technology (IRJET) - 2020), "wireless charging of electric vehicle: a review''.**

   Electric vehicles are today's zero emission vehicular technology which are considered as the future of automotive industry. The batteries of the vehicles get charged in order to drive the vehicle. The methodology of charging the electric vehicle currently is through plug-in method where the charging station charges the battery of an electric vehicle. However, an alternative method for charging the battery of an electric vehicle is through Wireless Power Transfer where it can be as a Static or Dynamic charging systems. Static Charging System can be implemented to charge the batteries of the electric vehicles when the vehicle is parked in static mode. Dynamic Charging System can be implemented to charge when the vehicle is in motion. This method of wireless charging of electric vehicle is done through inductive power transfer where wireless transmission of power is achieved by mutual induction of magnetic field between transmitter and receiver coil. The state of the battery is monitored using Battery Management system (BMS). This paper attempts to review about the difference between plug-in and

wireless charging of vehicle, operational principle of wireless charging, types of charging systems, static and dynamic wireless charging, application of dynamic charging system in future and drawbacks of wireless electric vehicle charging.

3. **A.M. Ahmed1 et.al. (Research Gate-2020), "Wireless power transfer for electric vehicle charging",** This paper reviewed the different technological solutions for WPT. A Proposed circuit of WPT system were constructed. The most challenging part was the coil design. It is extremely critical. The challenge was the misalignment which plays a major role in power transfer. However, a dynamic Inductive power transfer method is proposed. A simulation and experimental implementation were conducted. The design was tested with different situations in terms of distance and alignment. the wireless charging was achieved an efficiency of 90%.

❖ **Problem Statement :-**

Current technologies only allow electric vehicles to be charged through plug-in cable. However, the problem occurs when the user needs to find the charging point and the charging cable is lost or damaged. This project is about designing a wireless power transfer for electric vehicles. The concept of this project is suitable for any electric vehicles such as bus, car and light train. It will prepare a new convenient way to recharge the battery of the electric vehicles rather than using the traditional plug-in cable. With the implementation of wireless power transfer WPT in order to charge the electric vehicle, there is no physical connection or contact between the vehicles and the power supply. The process is fully automated, whereby no human handling works are required to vehicle can prevent this incident happen because no wire or cable is required and its transfer in electromagnetic form, so that, people will not get electrical shock in this kind of energy transfer.

❖ **Proposed System Methodology, Block Diagram, Circuit Diagram :-**

Proposed System Methodology :-

Wireless charging of electric vehicles can be done using Inductive Power Transfer (IPT). Requirement is to be able to charge a single device quickly and efficiently on a dedicated charging mat so inductive charging is preferred over others. IPT uses alternating magnetic fields as a mode of power transfer from primary coil to secondary coil. Suitable material for primary and secondary coil must be ensured for better power transfer. Windings of primary and secondary coil must be determined accurately to reduce loss and for effective electro-magnetic induction. Alternating field produced links with the on-vehicle pick-up pad, thereby enabling wireless power transfer (Usage of WPT). In stationary/static charging,

parking lots can be upgraded to charging EVs comfortably without handling any charging cable with charge-pads. Road should be constructed that consists of prefabricated concrete modules with cells laid on the ground with a layer of tempered glass that is translucent to light. System mainly has two sections, wireless power transmitter & a wireless power receiver sections. The transmitter section of the proposed system consists of a power source and a transmitter coil whereas the receiver section consists of a receiver coil, rectifier and filtering circuit, and a rechargeable battery. The AC power from the transformer is given to the primary coil which is implanted on the charging station. The flux is radiated out from the primary coil and this flux is linked with the secondary coil which induces current in the secondary coil in the EV. The alternating current induced in the secondary coil is converted to direct current which is then used to charge the battery of the EV.

Secondary voltage is given by,

$V2/V1=(N2/N1)$

$V2=V1(N2/N1)$

V1- Transmitter coil voltage

V2- Receiver coil voltage

N1- Transmitter coil turnsN2- Receiver coil turns

Assume that,

Transmitter coil voltage V1 = 5V

No of Receiving coil turns N2 = 15

No of Transmitting coil turns N1 = 15

$V2 = (5)(15/15)$

= 5 volts.

2. Below are the given formulas for required battery charging time in hours and

needed charging current in amperes as follows.

Charging Time of Battery = Battery Ah ÷ Charging Current

T = Ah ÷ A

Required Charging Current for battery = Battery Ah x 10%

A = Ah x 10%

Were,

T = Time in hrs.

Ah = Ampere Hour rating of battery

A = Current in Amperes

The Power Depends on The Current, Voltage and Power Factor.

In A DC Circuit, The Electrical Power Formula Is

P = I X V

In AC Circuits, The Formula of Electric Power Is

P = I X V X PF

I = P/(V X PF)

V = P/(I X PF)

Were,

I = Current

V= Voltage

P= Power

PF= Power Factor

- **Block Diagram** :-

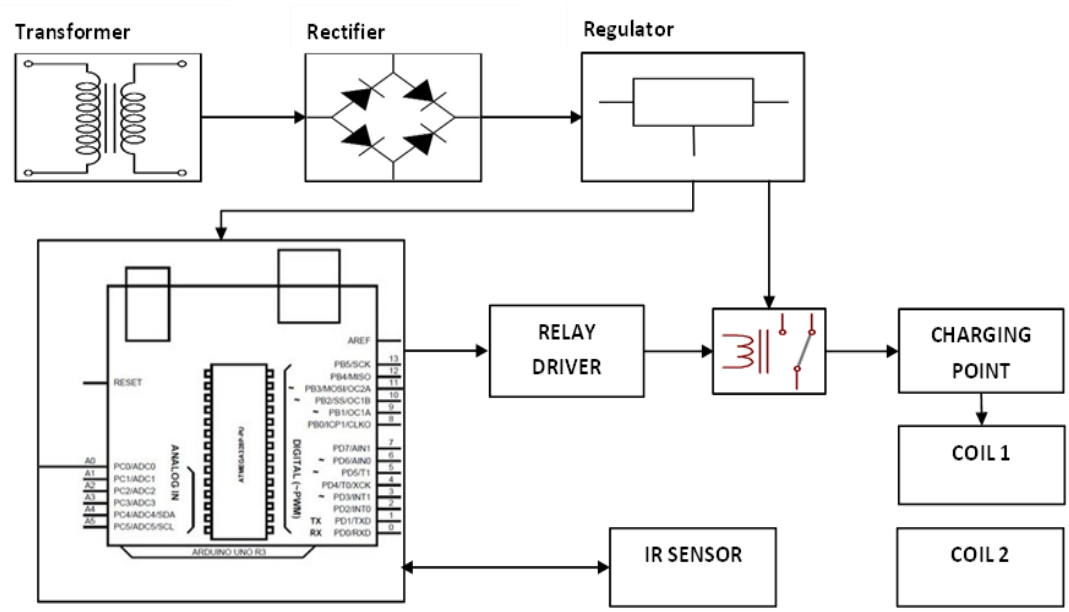

Fig:- Block Diagram of Electric vehicle wireless charging point.

- **Circuit Diagram :-**

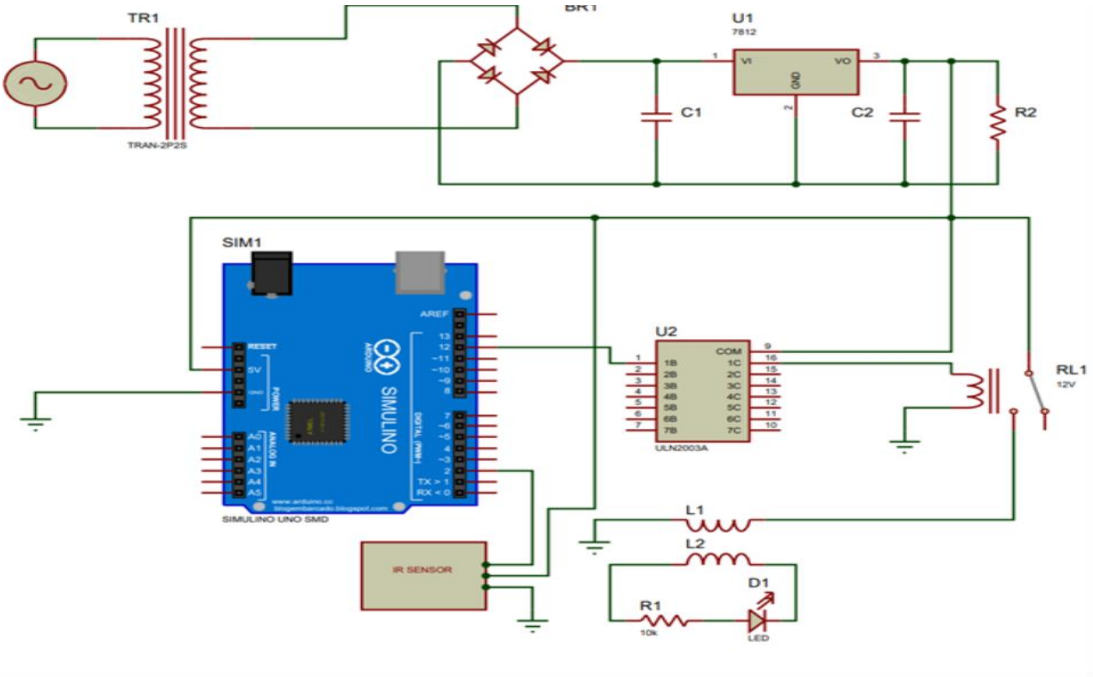

Fig :-Circuit Diagram Electric vehicle wireless charging point .

❖ **Outcomes** (Benefits to Societies) :-

1. Eliminates the need for a charging cable which is prone to damage, vandalism and potential safety concerns.
2. Improves user comfort and convenience as there is no need to manually plug in a cable – just park the vehicle over the charging pad and charging begins.
3. It will really make a make vehicle Autonomous.
4. Protected connections.
5. Durability.
6. Inductive charging Systems can be operated automatically without dependence on people to plug and unplug. This results in higher reliability.

❖ **List of Components with their Specifications :-**

Sr. No.	Name of Component	Specifications/Rating	Unit Price	Quantity	Approximate Cost
1	1phase Transformer	230/12 V AC	400/-	01	400/-
2	Rectifier Diodes	1N 4007	10/-	04	40/-
3	Capacitor	25V,1000µF	25/-	02	50/-
4	Resistor	1k	10/-	02	20/-
5	LED	-	100/-	01	100/-
6	IC7805	5v & 1.5A out	150/-	01	150/-
7	CKT board	-	100/-	01	100/-
8	Male conductor	-	-	01	-
9	buzzer	-	30/-	01	30/-
10	Copper Wire	-	-	As Per Reequipment	-
11	BC547 transistor	-	10/-	01	10/-
12	Photo diode	-	10/-	01	10/-
13	Arduino uno	-	1000/-	01	1000/-
14	IR sensor	-	150/-	01	150/-
15	General pcb	-	150/-	01	150/-
16	missioner	-	-	-	1000/-
				total	3300/-

Table :- List of Components with their Specifications.

❖ Advantages, Disadvantages :-

Advantage :-

1. Charging process is simple and automatic.
2. It doesn't require any human input.
3. It is small in size and compact compared to a wired system.
4. As it does not have any contact, there are no exposed electric connections.

Disadvantages :-

1. Standardization of charging system.
2. The difficulty of installation of a wireless charging system.
3. The vehicle has to park on the exact location where charger coils installed to charge the battery.
4. Electric cars are more expensive, and battery packs may need to be replaced.

❖ References :-

1. MD RAKIB RAIHAN RAZU, "Wireless Charging of Electric Vehicle", IEEE Transaction on Industrial Electronics, vol.9, No.12, pp 01-12, 2021.
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3. A.M. Ahmed , "Wireless power transfer for electric vehicle charging", vol 15, No.9,pp 01-09,2022

PHOTOGRAPH AND NAME


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