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Wireless Charger for Electric Vehicles

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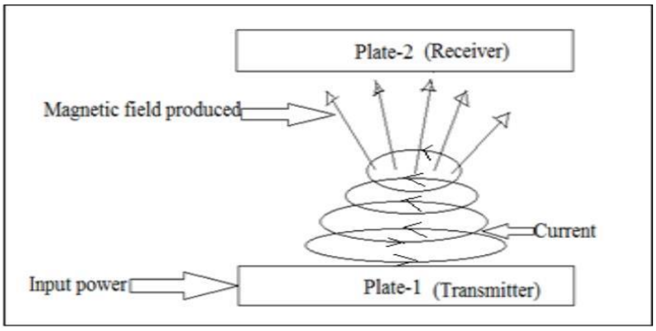
***Abstract*—Wireless charger is a hazel free charging process with no reminder for plug in process. The wireless charging so developed that it appears in almost all electronic and electrical applications. Electrical vehicles are in new urge of wireless power charging. As commercializing and modernizing charging means the range anxiety is to offended.**

***Keywords*—component, efficiency, conductivity, communication**

I. INTRODUCTION (*HEADING 1*)

Methods for charging any electrical vehicle are wired and wireless charging. In wireless charging resonant magnetic field. inductive charging is most trending method of wireless electric vehicle charging. In this charging process there are two important components the first are coils and second are transformers. As here there are two ends 1st is transmission end / sending end and 2nd is receiving end / charging end. If we compare this system to wired plug in method, we might think this method occupies more infrastructure but this provides more convenience and frequent charging to the vehicle. The que system at the charging station can cause huge time management issues as on the go charging can cause a lot of waiting time. Modernizing and commercializing this method we can charge any public place so as to reduce range anxiety. After the modification of the charging system the charging of the vehicle can controlled and losses can be prevented. For this system there is least risk of electrical hazards occurring.

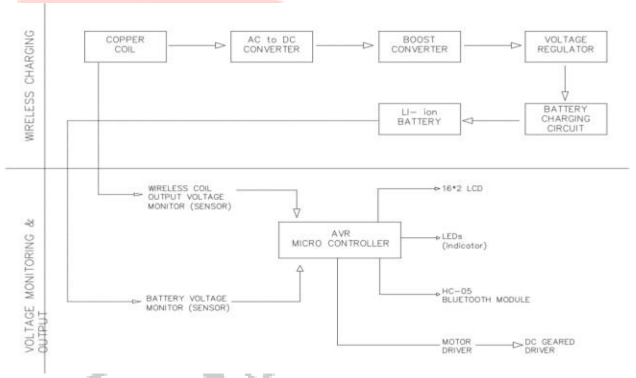
II. METHODOLGY



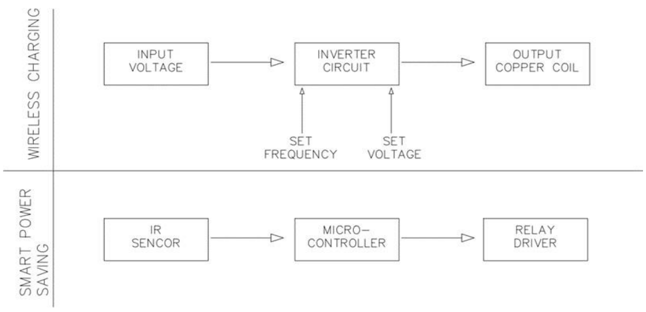
GENERAL DIAGRAM OF TRANSMITTING AND RECEIVING PLATE

A. *Circuit Diagram*

Circuit in Car

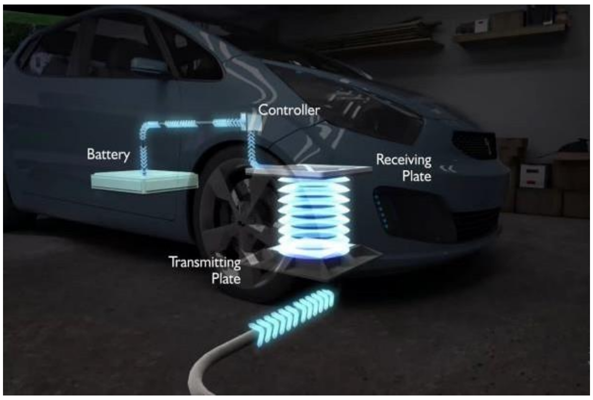


Circuit on ground



Mainly there are only five main components

1. Transformers
2. Coils (sending end coil & receiving end coil)
3. Li-ion Batteries
4. Controllers (micro controller, Bluetooth module)
5. Sensors



2.1 Coupling Theory:

It is based on the working principle of mutual inductance via a two-part transformer such that a change in current flow through one winding induces a voltage across the ends of the other winding through electromagnetic induction i.e. mutual induction. The inductive coupling between two coils or conductors by which the charging process is initiated.

2.1.1 Winding Structures:

Due to the absence of metal-metal contact, the shape, size, and location of the magnetic core become important and hence windings play an important role in an efficient power transfers. Recent development in magnetic circuits for coupling on-vehicle pads to ground-based pads at higher efficiency has improved significantly. When earlier developed pads and new polarized developed pads were compared, it is found that newly developed pads are much superior to the earlier ones.

2.2 Inductive Wireless Power Transfer:

Inductive power transfer (IPT) has been used successfully in several EV systems such as the GM EV1. The primary is the charging paddle and the secondary are embedded in epoxy. The charging paddle is inserted in the center of the secondary coil which begins the charging of theEV1 without any contacts or connectors at either 6.6 kW or 50 kW. This system is connector-less and wired. A universal IPT system using a 10kVA coaxial winding transformer for a 6.6 kW, 77 kHz, 200/400 V EV charger is presented in Fig 6 [8]. By utilizing a coaxial winding transformer benefits the ability to relocate all transformer core material off-board, and minimizes the sensitivity of on-board EV components to flux density and frequency. By using this method, the transformer makes it feasible to implement a single loop, which can operate over a wide frequency range and the ability to scale up to meet different power requirements. The design of the core of the transformer concerns with the impact of non-linear flux distribution which results in losses like eddy current losses and electromagnetic interferences. The losses mentioned above are dependent on the core size, increasing when the transformer is scaled up.

Roadway /Online Power Transfer:

The Online Electric Vehicle developed by the Korea Advanced Institute of Science and Technology is an innovative transportation system. In 2010, it ranked amongst the top 50 innovations in the TIME magazine. The KAIST OLEV uses the conversion of 60Hz frequency to 200kHz using an inverter which makes 200A of current flow through it with up to 80% efficiency transmitted wirelessly. When a vehicle is operating on a road with power transmitters installed in it, the power transmitter collects electricity from underneath the ground and distributes it either to the motor or the battery depending on the requirement. If there are no power give to transmitters then the OLEV runs on the battery. Hence this technology enables the OLEV to be mobile during charging.

If the short range of the EVs and the associated cost of infrastructure is considered, the feasibility of these charging system might be unfavorable. However, one advantage is that due to frequent and convenient charging, vehicles can be manufactured with a minimal battery capacity (about 20% compared to that of the conventional battery powered EVs), which can consequently minimize the weight and the price of the vehicle. A charger with narrow rail width, 10 cm, and large air-gap, up to 20 cm, was proposed. An efficiency of 74% was reported at 27 kW output power for a three phase supply input of 440 potential difference (V) and 20 kHz switching frequency.

In comparison to pure battery EV & battery replace EV , Hybrid EV , Plug-in hybrid EV and Roadway power EVs, do not require innovations in battery for commercialization; as these EVs can be readily available in markets using currently affordable EV batteries. When the power supply rails for transmitting power to RPEV are fully deployed under the road , RPEVs not require battery energy storage for their traction because they directly get required power from the road while they are moving on it.

Hence, RPEVs are most free from the battery-related problems among EVs and quite promising for future transportation of small cars, passenger cars, taxies, buses, trams, trucks, trailers, and trains, even in competition with internal Combustion engines.

Despite the fact that RPEVs are free from battery problems, RPEVs are not being widely used. The drawback of this technological solution is the high-power transfer from the road efficiently, within the bounds of economic status and safety. The power transfer is either wired or wireless. Earlier, the former method was preferred because of there was no advancement in wireless power transfer. The highest speed train is powered through pantographs, which are a sort of wired power transferring device. Because of the wearing of pantographs and due to the maintenance problems, wired power transfer is gradually replaced with wireless one as hundreds of kilowatts of power become available. Thus, various wireless power transfer systems (WPTSs) have been widely developed for RPEVs.

Important technical issues in the developments of inductive power transfer systems (IPTSs), the majority of WPTSs, are addressed, and major milestones of the developments of RPEVs are summarized, focusing on the developments of on-line electric vehicles (OLEVs) that have been recently commercialized.

OVERVIEW

Wireless power transfer is a generic term for a number of different technologies for transmitting energy by means of electromagnetic fields. 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.

At the transmitter the input power is reborn to AN periodic magnetic attraction field by some style of "antenna" device. The word "antenna" is employed loosely here; it should be a coil of wire that generates a field, a metal plate that generates an electrical field, AN antenna that radiates radio waves, or an optical device that generates light-weight. an analogous antenna or coupling device at the receiver converts the periodic fields to an electrical current. a vital parameter that determines the sort of waves is that the frequency, that determines the wavelength.

Wireless power uses identical fields and waves as wireless communication devices like radio another acquainted technology that involves voltage transmitted while not wires by magnetic attraction fields, utilized in cell phones, radio and tv broadcasting, and Wi-Fi. In radio communication the goal is that the transmission of data, that the quantity of power reaching the receiver isn't thus necessary, as long because it is decent that the knowledge may be received clearly. In wireless communication technologies solely little amounts of power reach the receiver. In distinction, with wireless power transfer the quantity of energy received is that the necessary factor, that the potency (fraction of transmitted energy that's received) is that a lot of vital parameters. For this reason, wireless power technologies area unit doubtless to be a lot of restricted by distance than wireless communication technologies.

CHALLENGES

➢ The most distinguished disadvantage of all WPT systems is that the undeniable fact that low potency energy is transferred. Most of the losses takes place throughout the energy transfer from coil to coil.

➢ Furthermore, installation price of WPT charging systems is going to be over plug-in charging strategies thanks to several factors, which has however isn't restricted to, redoubled infrastructure, merchandise and safety/shielding necessities. Hence, WPT may be harmful to eV shoppers because it isn't price effective.

CONCLUSION

In this article we have a tendency to reviewed the various technological solutions for WPT, their limitations and totally different applications. It additionally includes the advances created within the field like RPEV, OLEV and SPS. RPEV and OLEV area unit still used at a lower scale and SPS are going to be totally useful by 2040. There has been heaps of analysis on short vary power transmission however analysis continues to be happening to limit the losses in middle vary power transmission. Hence, WPT can lead the globe to a sophisticated, greener and a property future.

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