Implementation of Wireless Power Transmission for Mobile Charging

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Abstract— **This paper reproposed the conception and construction of a wireless mobile charger using inductive coupling.This system demonstrates the concept of wireless mobile charging system. The system allows user to wirelessly charge his mobile phone without plugging in the mobile adapter.The system is demonstrated using a charging pad where user just needs to place his adapter circuit to charge the mobile phone. For this purpose we utilize the advanced power transfer concept.**

Keywords—Conception and Construction, Inductive Coupling, Mobile Adaptor, Charging Pad, Advanced Power Transfer Concept.

I. INTRODUCTION

As time goes by, emerging technologies are making humanity's life simpler. As an example, there are of mobile phones, whose introduction has rapidly and greatly changed humans' lives. But although there is much advancement in the technology, there is still reliance on the wired battery chargers, in spite the fact that it presents some risks, such as power fluctuations. It was by thinking in the above-mentioned problem that the present project was chosen, a wireless mobile charger. This project falls in the categories of case study and solutions to real time social and economic problems. Wireless charging is the transmission of energy from a power source to a consuming device without wires or cables. This means that all wireless charging technologies are comprised of both a transmitter (or charging station) that transmits that energy and a receiver (integrated inside a device) that receives the energy to charges the battery of the device. In simpler terms, wireless charging is the transfer of power from a power outlet to your device, without the need for a connecting cable. It involves a power transmitting pad and a receiver, sometimes in the form of a case attached to a mobile device or built into the phone itself. When we said it was cable free, it is not quite, because the pad will have a cable going from the outlet into it Wireless mobile charging circuit mainly works on the principle of mutual inductance.Power is transferred from transmitter to receiver wire lessly based on the principle of "Inductive coupling". As shown in figure1 below various scientists and inventors contributed to the development of wireless power. Examining their backgrounds reveals the sources of their motivation and the methods by which they conducted research. The inventions developed during this time were more advanced than anything that had been seen before, solving challenging problems and developing the basic theories that yielded modern technology. These inventor's patents, papers, and experiments effectively describe the practicality and utility of wireless power propagation. Three prominent forms of power transmission are conduction, induction, and radiation. There are various formulas that explain how electrical power can be transmitted without the use of a physical conductor. Each mode of power transport has theories that govern how the electromagnetic waves carry power from a transmitter to a receiver. Public interest in wireless power has also increased with the application of Nikola Tesla ideas and inventions. As a result of this, the feasibility of technological implementation merits examination.

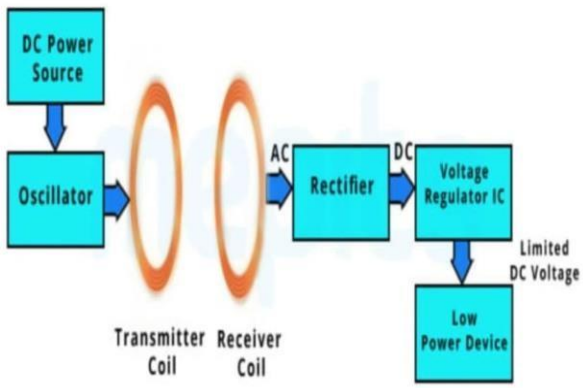

Figure1:Block diagram of wireless power transmission mobile charging circuit using Inductive Coupling.

II.Proposed System

The configuration of our system. There are following components: Wireless Power Charging Coils,Light Emitting Diode(LED),Resistor,Battery Cap,IRFZ44N MOSFET,Switch,9VBattery,Diodes,USB Cable, Transmitter Cable,Receiver Coil,1000UF Capacitor25 V,5V Regulator,Zero PCB.We need two coil a transmitter coil and receiver coil. An alternating current in the transmitter coil generates a magnetic field which induces a voltage in the receiver coil. This voltage can be used to power a mobile device

III. HARDWARE COMPONENTS

1. Wireless Power Charging Coils

Wurth Electronics Qi Wireless Power Charging Coils (WE-WPCC) allow power to be transferred wirelessly through inductive coupling. These charging coils and receivers go beyond the Qi standard of 20W with many of the coils capable of handling up to 200W. The Qi wireless coils come with a transmit coil and the receive coil. These coils are inductively coupled and the AC current in the transmit coil generates a magnetic field that induces a voltage in the receive coil.

2. Light Emitting Diode(LED)

LED is a semiconductor light source that emits light when current flows through it. When a current flows through the diode, electrons are able to recombine with electron holes within the device, releasing energy in the form of photons. This effect is called electroluminescence. The colour of the light (corresponding to the energy of the photons) is determined by the energy band gap of the semiconductor.

3. Capacitor

A capacitor can store electric energy when it is connected to its charging circuit. And when it is disconnected from its charging circuit, it can dissipate that stored energy, so it can be used like a temporary battery. Capacitors are commonly used in electronic devices to maintain power supply while batteries are being changed.

4. Resistor

It is an electrical device may be a passive two-terminal electrical part that implements resistance as a circuit component. In electronic circuits, resistors unit of measurement accustomed reduce current flow, alter signal levels, to divide voltages, bias active components, and terminate transmission lines, among completely different uses.

5. Battery cap

A battery assembled cap, a cylindrical battery with the cap and a method for making the same. ... The vent cap is attached to the battery cover by a hinge connection which allows for play between the vent cap and the battery cover and which allows for rotation of the vent cap.

6. IRFZ44N MOSFET

IRFZ44N belongs to the family of N-channel Power MOSFETs, covered in plasteic body and uses “Trench” technology. Similar to other transistors, it has three terminals named as Gate, Drain and Source. They are denoted by the alphabets G, D and S respectively. Its features include very low on state resistance, high speed processing technology, completely avalanche rated etc. Push pull systems and full bridge are few of its real life applications.Capacitor

7. Switch

A switch, in the context of networking is a high-speed device that receives incoming data packets and redirects them to their destination on a local area network (LAN). A LAN switch operates at the data link layer (Layer 2) or the network layer of the OSI Model and, as such it can support all types of packet protocols.

8. Battery

An electric battery is a device consisting of one or more electrochemical cells with external connections provided to power electrical devices such as flashlights, and electric cars. When a battery is supplying electric power, its positive terminal is the cathode and its negative terminal is the anode. The terminal marked negative is the source of electrons that will flow through an external electric circuit to the positive terminal. When a battery is connected to an external electric load.

9. DIODE

A diode is an electronic device which allows the current to flow in one direction only and blocks in other direction.

It is a semiconductor device that comes with two terminals called anode and cathode. An anode is positive while the cathode is negative.

10. USB CABEL

The resistance of a 3-5 ft cable is almost negligible assuming the cable isn't defective. So, charging cable length does not matter. But the wrong cable can slow down charging

speeds. USB cables have a data wire and a charging wire within the cable itself.

11.Transmitter Coil

Power supply is given to the transmitter. Copper coil is wound into number of turns as per the requirement. When the power is supplied to transmitter the coil energizes and results in the magnetic coupling. Hence the power is transferred. The transmitter coil is of diameter 10cm and no. of turns of the coil is 150.

12 .Receiver coil

The secondary receiver coils are similar designs to the primary sending coils. Running the secondary at the same resonant frequency as the primary ensures that the secondary has low impedance at the transmitter's frequency and that the energy is optimally absorbed. To methods can be used, the AC can be used directly rectified and a regulator circuit can be used to generate DC voltage. The receiver coil is shown in fig. 4.The receiver coil is of same diameter as transmitter coil but the no. of turns is 200.

13. 1000UF Capacitor

1000uF 25V Electrolytic Capacitor is a high quality electrolytic capacitor which offers long life and high reliability. Electrolytic Capacitors are most commonly used type of capacitors in Electronic Circuits. Electrolytic Capacitors have 2 Polaris - Positive and Negative.

14. 5V Regulator

5V voltage regulator, a three-terminal positive regulator with a 5V fixed output voltage. This fixed regulator provides a local regulation, internal current limiting, thermal shut-down control, and safe area protection

.IV. WORKING PROCEDURE

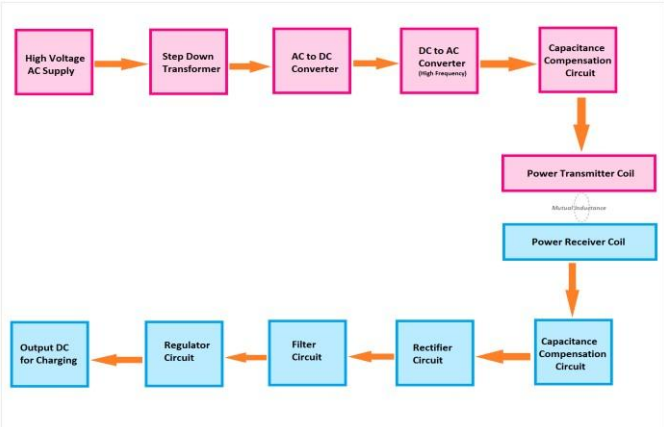

Figure2: Block diagram of wireless power transmission

Our Project basically consists of two sections one is transmitter and other is receiver. For wireless power transmission what we needed is the Primary coil and Secondary coil. As shown in Figure 2 above block diagram of wireless charger consists of Ac power supplier, rectifier, LC oscillator circuit, transmitter, receiver and current amplifier, which is shown in fig. 2. In the first step AC supply of 220V is given to the circuit, then transformer is connected which convert this 220V to 18V supply. This converted 18V is of AC nature and for further process this supply needs to convert into DC supply. For conversion, bridge rectifier is used. The conversion process of AC to DC gives ripples in output. For removing ripples a filter circuit is needed which consist of capacitor and resistor. After this smooth DC is obtained which is supplied to oscillator circuit consist of inductor and capacitor. Oscillators convert a DC input (the supply voltage) into an AC output (the waveform), which can have a wide range of different wave shapes and frequencies that can be either complicated in nature or simple sine waves depending upon the application. Then this signal is given to transmitter which transmits e

methods can be used, the AC can be used directly the signal. Then it is receive by receiver. The mobile phones are not charged at AC so we need to convert it again in DC output. Which is of low value therefore a current amplifier is needed for the circuit. Electric power is distributed as alternating current because AC voltage may be increased or decreased with a transformer. This allows the power to be transmitted through power lines efficiently at high voltage, which reduces the power lost as heat due to resistance of the wire, and transformed to a lower, safer,voltage for use

V. RESULT

Figure-3: Project Design.

The above figure 3 shows the output of functionality of the Wireless power transfer (WPT

or wireless charging) is a technology that allows transmission of energy through an air gap to a load without any interconnecting cables. The removal of ports and cables makes products less obtrusive and makes the recharging or powering of devices more convenient.

VI. CONCLUSION

Wireless charging can be as efficient as a wired charging. Based on the reviewed literature and collected data, suggests that wireless power transmission could be feasible. Modern science has now made it possible to use electricity without having to plug in any wires for charging. There are three techniques for wireless power transfer. Inductive charging has lower efficiency and increased resistive heating in comparison to direct contact. Implementations using lower frequencies or older drive technologies charge more slowly and generate heat within most portable electronics. Magnetic microwave has also some limitations Signal absorption by the atmosphere. Microwaves suffer from attenuation due to atmospheric conditions and towers are expensive to build. Researchers developed inductive charging using resonance where energy is transmitted between two copper coils that resonate at the same frequency. Of these two coils, one is the power transmitter and the other, the receiver. This is more feasible than other techniques and is safer than wired charging system. In this project, wireless charging of 1050mAh battery has been focused. The circuit for this purpose has been designed, fabricated, implemented and tested. This circuit consists of transformer, rectifier, oscillator tank circuit, transmitter coil, receiver coil, current amplifier. Initially, output current is 13mA so there is a need to amplify current by using a transistor based current amplifier whose gain is 0.93. Thereafter the output current found to be 450mA at 5V dc and it charges 100% battery in 30mins within the range of 6cms.Wireless power transmission has been the subject of many studies in the past, and will continue to be so in the future.

VII.APPLICATION

1. Wireless chargers can be used to charge mobiles, camera batteries, Bluetooth headsets etc.
2. This can also be used in applications like car battery charger with little modification
3. .It is used in charging handheld devices like phones, RFID tags and induction cooking.
4. This can also be used In wirelessly charging or continuous wireless power transfer in implantable medical devices like artificial cardiac pacemakers.
5. Proposed applications for this type include solar power satellites and wireless powered drone aircraft
6. In vehicle charging.

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VIII.FUTURE SCOPE

- Automatic wireless charging of mobile electronics (phones, laptops, game controllers, etc.) in home, car, office, Wi-Fi hotspots … while devices are in use and mobile.
- Direct wireless power and communication interconnections at points of use in harsh environments (drilling, mining, underwater, etc.) … where it is impractical or impossible to run wires.
- Automatic wireless charging for existing electric vehicle classes: golf carts, industrial vehicles.
- Automatic wireless charging for future hybrid and all-electric passenger and commercial vehicles, at home, in parking garages, at fleet depots, and at remote kiosks.
- Direct wireless power interconnections and automatic wireless charging for implantable medical devices (pacemaker, defibrilator, etc.)

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