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Wireless Power Transmission for Mobile Charging

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Abstract –

This paper represents the wireless power transmission for mobile charging. While travelling on the long route most of our youth is more comfortable with mp3 players, headphones and smartphones. Also now a day's smartphone are essential for cashless purpose. But the main issue with smartphone are their battery are running down .We are not able to carry charger everywhere & finding the place for charging the Smartphone. Here started the new Era of technology 'wireless power transmission'. This paper describes the importance of wireless power transmission in future days. The method applied for wireless power transmission is electromagnetic transmission. This help for the emergency need of battery.

Key Words: **Electrostatics, Electrodynamics, Mutual Inductance, Copper Coils, Wireless, Flux.**

INTRODUCTION

Many engineers of our country is facing the problem of power .For this reason many of engineers work hardly on wireless power transmission. The most effective method of wireless transmission is electromagnetic transmission. This method is very efficient in the aspect of cost & handling capacity. Wireless transmission is under developing technology since 1980`s due to lack of technology & financial support.

Fig-1: Concept of wireless power transmission

Nikola Tesla demonstrated a "transmission of electrical energy without wires" that depends upon electrical conductivity as early as 1891.Tesla demonstrates wireless transmitted by 'electrostatic induction' during 1891 lecture at Columbia College. The two metal sheets are connected to Tesla coil oscillator which applies high Voltage radio frequency alternating current. An oscillating electric field between the sheets.

Proposed System:

Figure 1 illustrates the configuration of our system. There are following components: 1) Transformer; 2) MOSFET; 3) Filter; 4) Rectifier; 5) Regulator; 6) PIC16F877A; 7) LCD; 8) Sending Coil; 9) Receiving Coil. 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 or charge a battery.

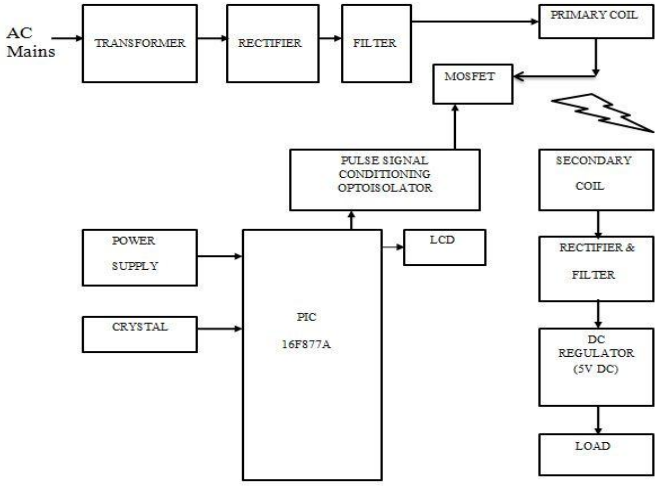

Fig-3: System configuration

WORKING:

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. A 230V 50 Hz AC supply is been proceeded through the transformer, Rectifier and filter where this filter produce 24V DC in the coil. Now with the help of PIC microcontroller we produce a PWM pulse of 1 KHz Frequency, which is given to the Power MOSFET IRZ44. MOSFET is connected to the coil which will continuously vary voltage in the coil. So we know according to the 'Faraday's Law of Mutual Inductance any change in magnetic field of coil will cause an EMF to be induced in coil. And if Conductor circuit is closed the current will also circulate through the circuit.' Here the transformer action will takes place, where air is acting as core.

Function of each block:

Transformer: The AC mains is supplied to the 12-0-12, 3A Transformer. This is the step down transformer which converts high ac voltage to low ac voltage.

Rectifier: the low ac voltage developed by the transformer is given to full wave rectifier here we have used 1N4007 diodes for the rectifications.

Filter: the wave generated from rectifier is given to the 1000uF capacitor for filtering action. It removes spikes and produces a clear dc waveform up to 25volt dc ready to be circulated from the copper coil that is the primary windings.

Pic64F877A: on the other side we used microcontroller pic 16F877A to produce a PWM wave which is later given to the power MOSFET IRZ44. The PWM pulse is required to give to the primary coil, so that it will produce the change in magnetic field of the coil, which will be helpful to generate an EMF, which can be induced at secondary side. The program is burned to generate the PWM pulse in the Controller also to display information on the LCD.

Power Supply for Pic16F877A: The power supply circuit of 5V is designed for PIC controller, which consist of 9-0-9, 1A transformer, full wave rectifier, and a capacitor filter and a voltage regulator 7805.

Crystal Oscillator: The crystal of 9MHz frequency is used to provide external frequency to the controller. Which consist of two capacitors of 22pF. Also the reset circuit consists of a 10K resistor and 10uF capacitor to reset the pic microcontroller.

LCD Display: The LCD display of 16*2 is used to display the frequency and other details of the project. Also the POT of 1K is connected to pins of LCD to control the contrast of the display.

Power MOSFET IRZ44: The Z44 MOSFET is used for the handle high voltage applications. It consists of three terminal gate, drain and source. Here the source is grounded, the PWM pulse is given to gate and drain terminal is connected to the primary coil. Hence the MOSFET action will take place and it produces the oscillations in the coil. Here after this action we feel that primary coil is vibrating.

The distance between the transmitting and receiving coil is depends upon following three factors:
1) No. of turns of coil
2) Frequency generated In the coil.
3) Voltage generated by transmitting section

Also the design of primary and secondary that is the number of turns depends upon the following formula, the inductance is depends upon the number of turns of coil:

$$L = \frac{N^2 uA}{I}$$

Where,

L=inductance of coil in Henry
N=No. of turns in wire coil
u=permeability of core material
u_r= relative permeability, dimensionless
u_0=1.26*10^-6T –m/At permeability of free space
A=area of coil in square meter
I=average length of coil in meter

The inductance generated in coil according to mutual inductance principle is given by,

$$\phi = \frac{B}{A}$$

Where,
B= Flux Density
A= Area of coil

Receiver Section: At the secondary side we need the secondary coil to receive the power from primary coil. Here many power losses appears in the transmission, hence we get up to 8 to 9 volts at receiver section. As this project is mainly designed for wireless mobile charging for that we need to design extra circuit to produce 5V dc at the output.

After the secondary coil we designed rectifier and filter circuit to produce 5V dc supply efficiently for load. At the last stage we use the voltage regulator 7805 to produce 5v for mobile charging.

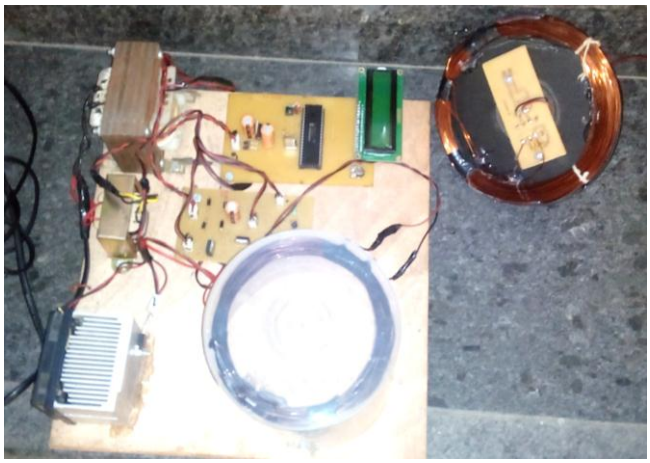

Fig-4: Project Design.

CONCLUSION

This paper proposes wireless power transmission is very efficient in the region where use of wire is very hazardous. Wireless power transmission of electric power can be considered as a large scope in electrical engineer for future prospect power generation and transfer. Various method and aspect regarding wireless transmission of electrical power.

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