SOLAR WIRELESS ELECTRIC VEHICLE CHARGING SYSTEM

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1. Abstract

Electric vehicles not only assist the environment, but they also help reduce traffic. The cost of travelling using electricity, which is significantly less expensive than fuel. We produce an EV charging system that provides a unique, original solution in this instance. Without having to stop oruse any cables, vehicles may charge while they are moving. No additional power source is needed because the charging system is solar-powered. The system is built using. Among other components. As a result, research demonstrates how an integrated wireless solar-powered charging system for electric automobiles may be used.

KEY WORDS: Solar Panel ,Transformer, Copper Coils,

2. INTRODUCTION

The need for energy is currently the biggest problem facing theglobe. Wireless power transmission (WPT) is one of the technologies that has experienced the quickest growth in the previous two to three years for transferring power without cables. It is highly reliable and efficient to use this brand-new, cutting-edge technology. Today, wireless power transmission iscrucial because it keeps driving electric automobiles profitable.

In the past 20 years, inductive and magnetic has been used totransmit power. This paper will use solar energy to recharge the battery and support many devices. As a result, it gains more

The objective of the project is to develop a smart wireless charging infrastructure for solar-powered electric automobiles. The car also makes use of wireless power transfer coils to storeenergy in its electric vehicle battery.

Today, it is more difficult to achieve balance between electricity use and production. The most effective strategy to rectify this equation's imbalance is to maximize the utilization of solar energy. Utilizing solar energy is a challenge because solar cell panels need to be exposed to as much sunlight as feasible. The sun's light strength varies from dawn to evening if the solar panel is positioned in a specific direction. The solar output can be increased by turning the solar panel towards the sun.

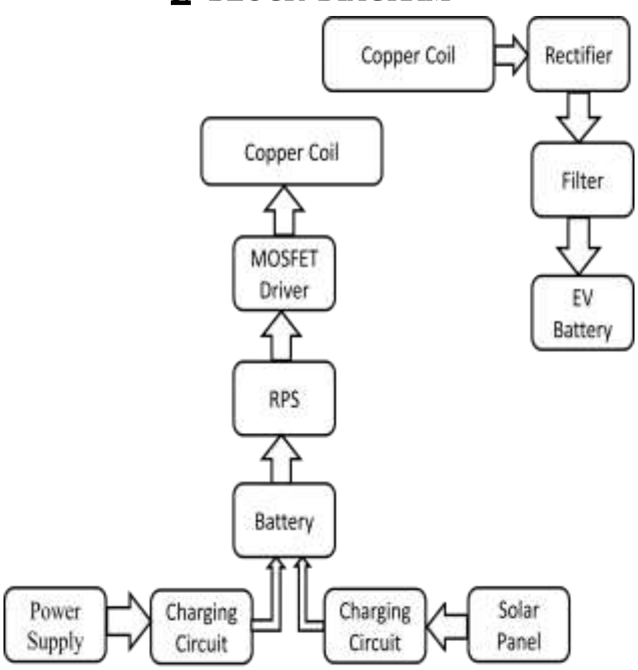
Wireless communication is advantageous when running wires between devices would be difficult, dangerous, or impossible. In contrast to wireless telecommunications, like radio, the issue with wireless power transmission is different. In the latter, energy received only hits a critical level if it is too low to tell the difference between the signal and background noise. The more crucial element in wireless power is efficiency. To make the system financially viable, a reach a substantial portion the receiver or receivers, all of the energy generated by the generating plant must.

Frequency range for RF communication is 30 KHz to 300 GHz. Electromagnetic waves must be created at a source andpicked up at a certain destination for RF communication to work. Nearing the speed of light, these electromagnetic waves move through the atmosphere. An electromagnetic signal's wavelength is inversely correlated with its frequency;the greater the frequency, the shorter the wavelength.

Two self-resonating copper coils of the same resonating frequency generator make up the project. The power source (transmitter) is connected to one copper wire, while the device is connected to the other copper wire. The copper coil that is linked to the power source begins oscillating at a specific frequency as a result of the power source's electric current .Nonmagnetic radiations then start to flood the area around the copper coil.

The magnetic field that is created allows electricity to likewise be transported to the other copper coil attached to the receiver. This coil begins oscillating at the same frequency as the previous coil since it shares the same frequency. This is the 'coupled resonance' and Tesla principle. This project creates a device that uses copper coils to transmit power wirelessly overa great distance. The transmitter circuit of the system makes use of a frequency generator. As a result, wirelessly connected rectifier and regulator allow the current to travel from the coil on the transmitter side to the coil .The battery charging circuit receives the regulator's output and uses it.

3. BLOCK DIAGRAM



4 HARDWARE REQUIREMENT

1. Solar Panel
2. Charging Circuit

3. Transformer
4. MOSFET Driver
5. Copper Coil
6. Rectifier
7. Filter
8. LED

4.1 SOLAR PANEL

Solar cells, also referred to as photovoltaic cells, use the photovoltaic effect to transform solar energy into electrical current. When there is no obvious source of energy, the term photovoltaic cell is frequently used. How ever the term solar cell is occasionally only used to describe systems specifically made to harvest solar energy. Cell assemblies are used to build photovoltaic arrays, solar modules, and solar panels. Photovoltaic technology and research are focused on the use ofsolar cells for solar energy.

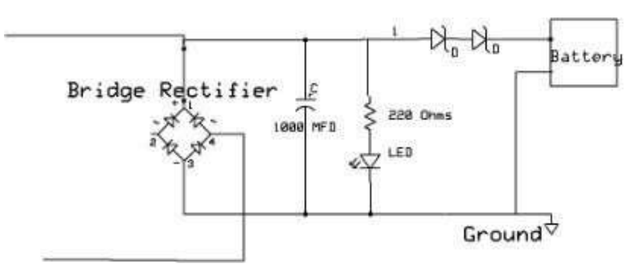
induction. Electricity from the primary circuit flows via the transformer when a load is connected to the secondary, and it then passes from the secondary winding to the load. Lines of force are what make up this field, which resembles a barmagnet.

The force lines escape the coil when the current is increased. The lines are restricted due to the stream MUTUAL INDUCTION. If a step-down transformer is used, because the secondary winding has fewer turns than the primary winding, it will accept less flux and produce less voltage. Primary winding generates more flux in comparison to secondary winding.

4.2 CHARGING CIRCUIT

The charging circuit we may use to charge the solar-powered battery is shown in the circuit diagram above.
The rectifier receives the output of the solar panel (12v).

The usage of a capacitor allows for the removal of these spikes. At the output terminal, we can obtain 12V Steady DC, which can be seen if the light emitting diode.

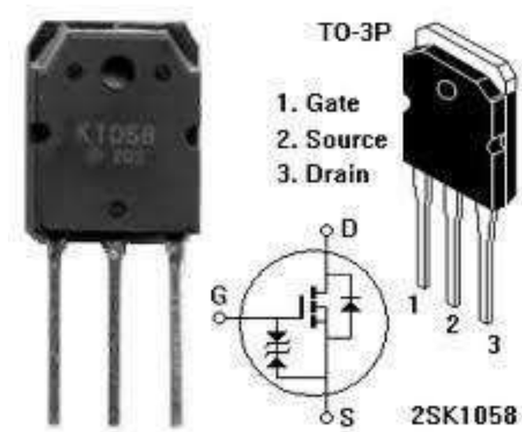


4.3 TRANSFORMER

Without altering the frequency of the receiving circuit, electrical energy can be transferred across circuits using a transformer with inductively coupled wires. A changeable primary or first winding current causes a fluctuating magnetic flux in the transformer's core, which also has an impact on the magnetic field of the secondary winding. The secondary winding's electromotive force or voltage shifts due to this shifting magnetic field, which is referred to as mutual

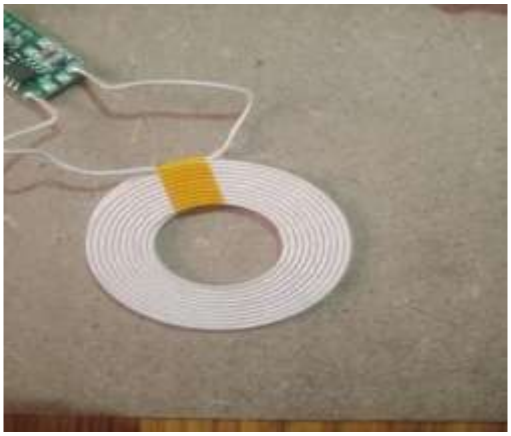
4.4 MOSFET Driver

An electronic signal can be switched or amplified using a transistor known as a metal-oxide-semiconductor field-effect transistor. The MOSFET has four terminals: source (S), gate (G), drain (D), body (B). However, the body (or substrate) of the MOSFET is typically linked to the source terminal, turning it into a three-terminal device similar to other field-effect transistors. When two terminals are interconnected (short- circuited), only three terminals are displayed in electrical diagrams. Despite the fact that the bipolar junction transistor was once far more prevalent, the MOSFET is by far the transistor that is used the most in both digital and analogue circuitry.



4.5 COPPER COIL

An electromagnetic coil (or simply "coil") is produced when a conductor—typically an insulated solid copper wire—is wound around a core or form to generate an inductor or electromagnet. One or more turns, frequently called wire loops, make up a coil. Using a coil and the same frequency as a wireless power receiver, a wireless power transmitter creates a magnetic field.



4.6 RECTIFIER

Rectifier is the name for a circuit that converts ac to dc. There are two different kinds of rectifier.

1. Full-wave Rectifier
2. Half-wave Rectifier

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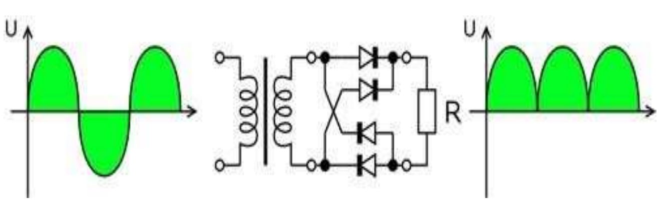
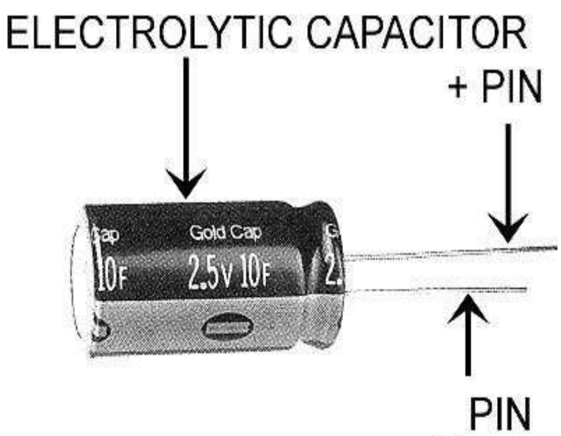
In the diagram shown below, the bridge rectifier circuit is depicted. Using both half cycles of the input ac voltage, it converts an ac voltage to a dc voltage. The bridge rectifier circuit is shown in the diagram. Four linked diodes form the bridge in the circuit. At the bridge's diagonally opposed ends, the ac input voltage is introduced. By the load resistance, the other two ends of the bridge are joined.



4.7 FILTER

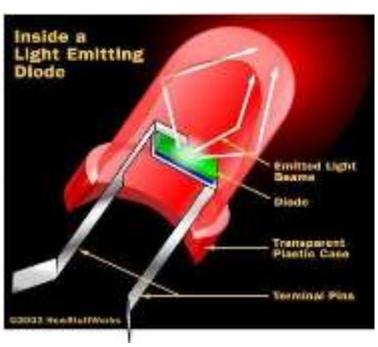
Rectifier output is not entirely pure DC. It might have some pulsating DC ripple components in it. We are employing a filter to eliminate the ripple components that are present in the output.

A filter is a type of circuit that cleans up output after it has been corrected. We have a wide variety of filters. To remove output ripples, the majority of power supply use capacitor filters. The capacitor employed at the input side following the solar panel serves as a filter to eliminate any errant ripple or noise signal.

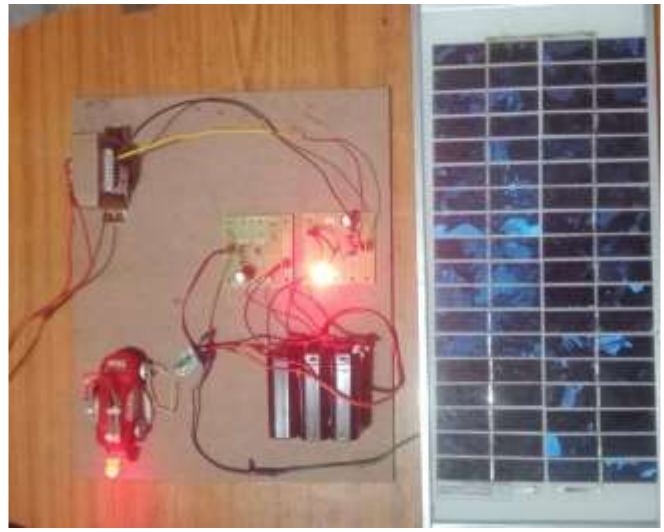


4.8 LED

Light emitting diode devices are semiconductor products. In the same way that transistors and other kinds of diodes are made of silicon, so are light emitting diodes .Light emitting diodes emits light as a result of the addition of tiny quantities of chemical impurities like gallium, arsenide, indium, and nitride to silicon. As a consequence of current flow, the light emitting diode emits photons. A metal filament is heated to a white hot state in order to produce light in standard light bulbs. Compared to incandescent bulbs, light emitting diodes are significantly more efficient since they generate photons directly rather than using heat. Light emitting diode glows to show that an electric vehicle is charging



5. Hardware Output



The six essential parts of our experiment were the pulse generator, transmission coil, receiving coil, rectifier, and load. Item A shows a single loop of insulated copper wire as the copper coil. Objects B and C represent the sending coil and receiving coil, respectively. The copper tube coils can resonate the same frequency because of their comparable designs

Spacing between the coils influences the resonance frequency of our coils, where we get most power. So that we could change the frequency as needed, we decided to employ a frequency generator. Numerous oscillators were constructed top reduce various frequencies, but because our resonance frequency varies, a frequency generator similar to a pulse generator was used. Because we can generate the most power at the resonance frequency of our copper coils, afrequency generator produces a signal at this frequency.

The generated signal is fed into the loop that drives our 10- gauge wire. The loop is only a little bit smaller than our core coil, with a diameter of roughly 55.5 cm. The wire loop of the driving loop behaves like a dipole because of the AC currentpassing through it. As close as is practical, the driving loop is positioned parallel to the primary coil. The primary coil becomes resonant due to the flux produced by the driving loop. Important to note is that the driving loop does not directly cause the secondary loop to resonate. The secondary coil resonates as a result of the evanescent waves generated by the first coil since the coils are comparable in size, shape, and mass(or nearly so). Copper tubing with an inner diameter of 1/4inch and an exteriordiameter of 3/8 inches is used to create the primary coil and the secondary coil. Each coil has 10 turns and needs 60 feet or 57.5 centimeters of tubing to complete. When the two coils are parallel to one another and resonating, the driving loop is only using enough energy to cause the first coil to drive at this point. The quantity of power transmitted depends on the separation between the primary and secondary coils. As the coils are separated from one another, the power dramatically decreases. An increased magnetic field is created while the secondary coil vibrates at its resonance frequency. The secondary coil runs parallel to the 10 gauge wire receiving loop. The magnetic fluxof the secondary coil drives a resistive load and generates the current in the receiving loop.

This project produces a gadget that transmits energy wirelessly through copper coils over a distance of around 10 cm. The transmitter circuit of the system uses a pulse generator running at100 KHz. The coil on the transmitter side transmits current wirelessly to the coil on the receiver side as a result. The rectifier then changes the AC voltage to DC voltage needed to charge the EV battery.

5. CONCLUSION

Based on the copper coils experiment for wireless power transmission as a whole. According to research on wirelesspower transmission, the voltage communicated increases with proximity. Both the frequency range and the physical distance

support this. On results from experiments, this is based

.According to the test results, wireless power transmission can be done up to one inch away and is most effective when done close to the source.

REFERENCES

[1] Sourabh Pawade, Tushar Nimje, Dipti Diwase. GoodbyeWires: Approach to Wireless Power Transmission. IJETAE. 2012; 2(4).

[2] Wenzhen Fu, Bo Zhang, Dongyuan Qiu. Study on Frequency-tracking Wireless Power Transfer System by Resonant Coupling. College of Electric Engineering South China University of Technology Guangzhou, P. R. China. 510641.

[3] M. Fareq, M. Fitra. Solar Wireless Power Transfer Using Inductive Coupling for Mobile Phone Charger. IEEE conference Publications. 2014: 473-476. Doi:10.1109 /PEOCO.

[4] T.S. Hasarmani. Wireless Power Transmission forSolarPower Satellite. Department of Electrical Engineering. Bharati Vidyapeeth University's College ofEngineering. 2011.

[5] Rosa, Edward B. The Self and Mutual Inductances ofLinear Conductors. Bulletin of the Bureau of Standards. 1908; 4(2): 301–344. doi:10.6028/bulletin.