DESIGH OF ELECTRICAL VEHICLE CHARGING STATION MONITORING AND CONTROL BY USING SOLAR

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ABSTRACT

Global environmental concerns and the escalating demand for energy, coupled with steady progress in renewable energy technologies, are opening up new opportunities for utilization of renewable energy resources. Solar energy is the most abundant, inexhaustible and clean of all the renewable energy resources till date. Global warming has led to the large adoption of Electric Vehicles (EVs) which appear to be the best replacement to IC engines. Due to increased number of EVs on road, charging of the vehicles with conventional fossil fuel-based grid is not economical and efficient. Thus, a renewable energy-based charging station finds immense potential and control for electric vehicle charging. An electric vehicle charging station integrating solar power and a battery energy storage system (BEES) is designed for current scenario. For uninterrupted power in the charging station an additional grid support is also considered without becoming an extra burden to the grid.

1.INTRODUCTION

1.1 GENERAL:

Automation has created a bigger hype in the electronics. The major reason for this type is automation provides greater advantages like accuracy, energy conversation, reliability and more over the automated systems do not require any human attention. Any one of the requirements stated above demands for the design of an automated device.

Wireless energy transfer or wireless power is the transmission of electrical energy from a power source to an electrical load without a conductive physical connection. Wireless transmission is useful in cases where interconnecting wires are inconvenient, hazardous, or impossible. The problem of wireless power transmission differs from that of wireless telecommunications, such as radio. In the latter, the proportion of energy received becomes critical only if it is too low for the signal to be distinguished from the background noise. With wireless power, efficiency is the more significant parameter. A large part of the energy sent out by the generating plant must arrive at the receiver or receivers to make the system economical. The most common form of wireless power transmission is carried out using direct induction followed by resonant magnetic induction.

The project consists of two self resonating copper coils of same resonating frequency of about 100KHZ. One copper wire is connected to the power source (transmitter), while the other copper wire is connected to the device (Receiver).The electric power from the power source causes the copper coil connected to it to start oscillating at a particular (KHz) frequency. Subsequently, the space around the copper coil gets filled with nonmagnetic radiations. This generated magnetic field further transfers the power to the other copper coil connected to the receiver. Since this coil is also of the same frequency, it starts oscillating at the same frequency as the first coil. This is known as 'coupled resonance' and is the principle of Tesla. This project results in a device where the electricity is transmitted wirelessly through copper coils for a distance range of about 5 cm. The system uses pulse generator of 100 KHZ at the transmitter circuit. Therefore, the current flows from the coil on the transmitter side to the receiver side coil wirelessly connected with rectifier and regulator. In this project we are using transformer, RPS, Pulse Generator, a pair of copper coils, rectifier, filter and a load

FEATURES:

1. Copper Coil System

2. Usage of pulse generator

3. Highly Sensitive

1.2 PAPER OVERVIEW:

The project “DESIGN OF EV CHARING STATION MONITORING AND CONTOLLING BY USING SOLAR” using copper coils, function generator as PIC 16F72, switch, MOSFET’s, and regulated power supply is an exclusive project that can generate power wirelessly using copper coils.

2. BLOCK DIAGRAM

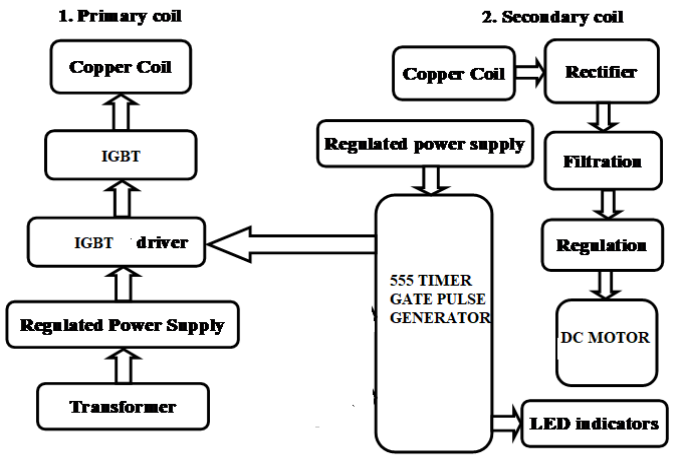


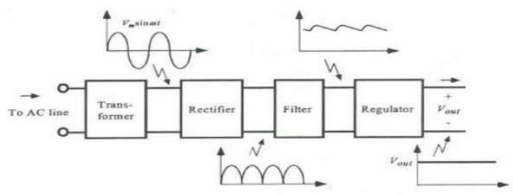
FIG 2.1: Block diagram Design of EV Battery charging station using solar

3. HARDWARE DESCRIPTION

3.1 POWER SUPPLY

The input to the circuit is applied from the regulated power supply. The a.c. input i.e., 230V from the mains supply is step down by the transformer to 12V and is fed to a rectifier. The output obtained from the rectifier is a pulsating d.c voltage. So in order to get a pure d.c voltage,

the output voltage from the rectifier is fed to a filter to remove any a.c components present even after rectification. Now, this voltage is given to a voltage regulator to obtain a pure constant dc voltage.



3.1 Block Diagram of Power supply

3.2 TRANSFORMER

A transformer is a device that transfers electrical energy from one circuit to another through inductively coupled electrical conductors. A changing current in the first circuit (the primary) creates a changing magnetic field; in turn, this magnetic field induces a changing voltage in the second circuit (the secondary). By adding a load to the secondary circuit, one can make current flow in the transformer, thus transferring energy from one circuit to the other.

The secondary induced voltage V_S, of an ideal transformer, is scaled from the primary V_P by a factor equal to the ratio of the number of turns of wire in their respective windings:

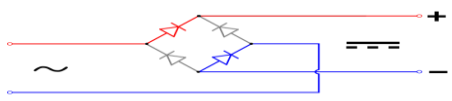
$$\frac{V_S}{V_P} = \frac{N_S}{N_P}$$

3.3 BRIDGE RECTIFIER

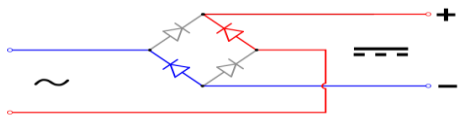
A diode bridge or bridge rectifier is an arrangement of four diodes in a bridge configuration that provides the same polarity of output voltage for any polarity of input voltage. When used in its most common application, for conversion of alternating current (AC) input into direct current (DC) output, it is known as a bridge rectifier. A bridge rectifier provides full-wave rectification from a two-wire AC input, resulting in lower cost and weight as compared to a center-tapped transformer design, but has two diode drops rather than one, thus exhibiting reduced efficiency over a center-tapped design for the same output voltage.

3.3.1 BASIC OPERATION

When the input connected at the left corner of the diamond is positive with respect to the one connected at the right hand corner, current flows to the right along the upper colored path to the output, and returns to the input supply via the lower one.

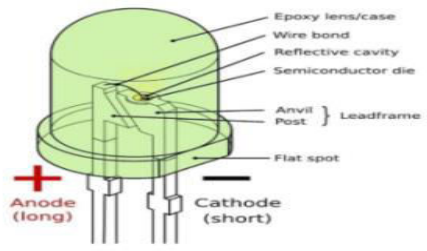


When the right hand corner is positive relative to the left hand corner, current flows along the upper colored path and returns to the supply via the lower colored path.



3.4 LIGHT EMITTING DIODE(LED):

LED is abbreviation of Light Emitting Diode. It's nothing, but just a combination of semiconductors which emits light when current pass through it . Over the years, semiconductor technology has advanced to bigger heights, Light Emitting Devices have also been a part of this revolution and as a result, Now we have LED's which give better illumination with low power consumption.

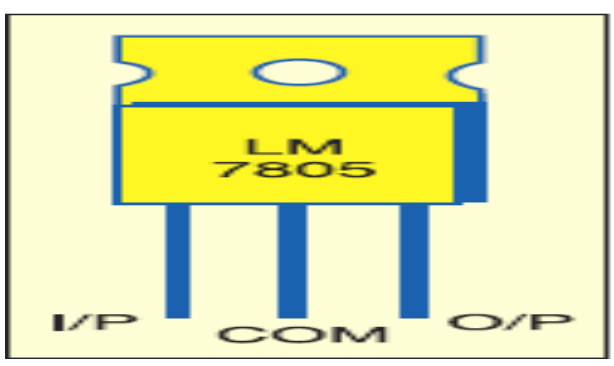


3.5 REGULATION:

The process of converting a varying voltage to a constant regulated voltage is called as regulation. For the process of regulation we use voltage regulators.

VOLTAGE REGULATOR:

A voltage regulator (also called a 'regulator') with only three terminals appears to be a simple device, but it is in fact a very complex integrated circuit. It converts a varying input voltage into a constant 'regulated' output voltage. Voltage Regulators are available in a variety of outputs like 5V, 6V, 9V, 12V and 15V. The LM78XX series of voltage regulators are designed for positive input. For applications requiring negative input, the LM79XX series is used. Using a pair of 'voltage-divider' resistors can increase the output voltage of a regulator circuit.It is not possible to obtain a voltage lower than the stated rating. You cannot use a 12V regulator to make a 5V power supply. Voltage regulators are very robust. These can withstand over-current draw due to short circuits and also over-heating. In both cases, the regulator will cut off before any damage occurs. The only way to destroy a regulator is to apply reverse voltage to its input. Reverse polarity destroys the regulator almost instantly. Fig: 2.10 shows voltage regulator.

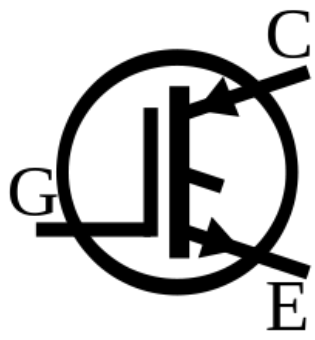


3.6 COPPER COILS:

An *electromagnetic coil* (or simply a "coil") is formed when a conductor (usually an insulated solid copper wire) is wound around a core or form to create an inductor or electromagnet. One loop of wire is usually referred to as a *turn*, and a coil consists of one or more turns. For use in an electronic circuit, electrical connection terminals called taps are often connected to a coil. Coils are often coated with varnish or wrapped with insulating tape to provide additional insulation and secure them in place. A completed coil assembly with taps is often called a *winding*. A transformer is an electromagnetic device that has a *primary winding* and a *secondary winding* that transfers energy from one electrical circuit to another by inductive coupling without moving parts. The term *tickler coil* usually refers to a feedback coil, which is often the third coil placed in relation to a primary coil and secondary coil.
A coil tap is a wiring feature found on some electrical transformers, inductors and coil pickups, all of which are sets of wire coils. The coil tap(s) are points in a wire coil where a conductive patch has been exposed (usually on a loop of wire that extends out of the main coil body). As self induction is larger for larger coil diameter the current in a thick wire tries to flow on the inside. The ideal use of copper is achieved by foils. Sometimes this means that a spiral is a better alternative. Multilayer coils have the problem of interlayer capacitance, so when multiple layers are needed the shape needs to be radically changed to a short coil with many layers so that the voltage between consecutive layers is smaller.

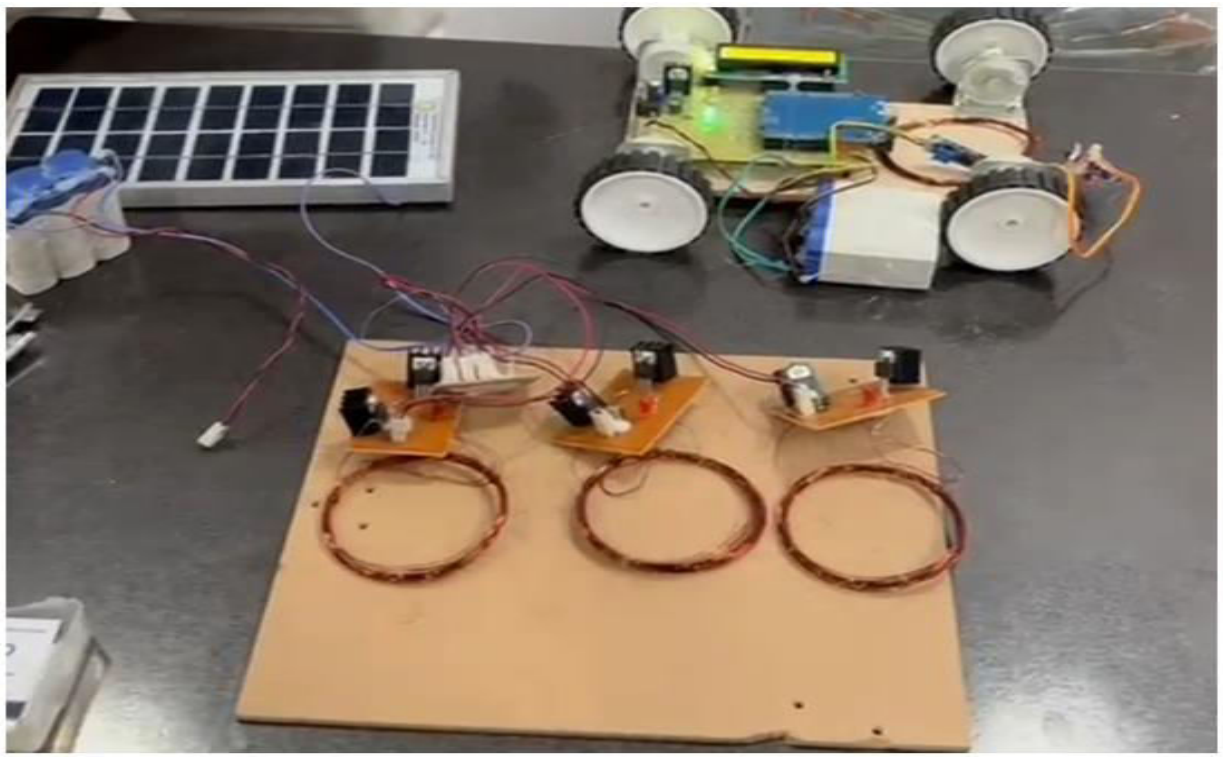
3.7 IGBT
INTRODUCTION

The insulated-gate bipolar transistor or IGBT is a three-terminal power semiconductor device primarily used as an electronic switch and in newer devices is noted for combining high efficiency and fast switching. It switches electric power in many modern appliances: Variable-Frequency Drives (VFDs), electric cars, trains, variable speed refrigerators, air-conditioners and even stereo systems with switching amplifiers. Since it is designed to turn on and off rapidly, amplifiers that use it often synthesize complex waveforms with pulse width modulation and low-pass filters. In switching applications modern devices boast pulse repetition rates well into the ultrasonic range—frequencies which are at least ten times the highest audio frequency handled by the device when used as an analog audio amplifier.



The IGBT combines the simple gate-drive characteristics of the MOSFETs with the high-current and low-saturation-voltage capability of bipolar transistors by combining an isolated gate FET for the control input, and a bipolar power transistor as a switch, in a single device. The IGBT is used in medium- to high-power applications such as switched-mode power supplies, traction motor control and induction heating. Large IGBT modules typically consist of many devices in parallel and can have very high current handling capabilities in the order of hundreds of amperes with blocking voltages of 6000 V, equating to hundreds of kilowatts.

4.RESULTS



The project **“DESIGN OF EV BATTERY CHARGING STATION USING SOLAR”**was designed such that wireless energy transfer or wireless power is the transmission of electrical energy from a power source to an electrical load without a conductive physical connection. Wireless transmission is useful in cases where interconnecting wires are inconvenient, hazardous, or impossible.

5. CONCLUSION

Integrating features of all the hardware components used have been developed in it. Presence of every module has been reasoned out and placed carefully, thus contributing to the best working of the unit. Secondly, using highly advanced IC’s with the help of growing technology, the project has been successfully implemented. Thus the project has been successfully designed and tested.

6. FUTURE SCOPE

Our project "DESIGN OF EV BATTERY CHARGING STATION USING SOLAR" is mainly intended to Wireless energy transfer or wireless power is the transmission of electrical energy from a power source to an electrical load without a conductive physical connection. Wireless transmission is useful in cases where interconnecting wires are inconvenient, hazardous, or impossible.

This project results in a device where the electricity is transmitted wirelessly through copper coils for a distance. The system uses function or pulse generator as PIC16F72 microcontroller at the transmitter circuit. Therefore, the current flows from the coil on the transmitter side to the receiver side coil wirelessly connected with rectifier and regulator.

In this project we are using transformer, RPS, Pulse Generator PIC16F72 microcontroller, a pair of copper coils, rectifier, filter and a load
This system is incapable of giving feed back of the devices being operated. This can be eliminated by using LCD display technology, which displays the voltage measured on the LCD display unit also gives the feedback through LED indicators. GSM module also can be used to get the feedback of the electrical devices by sending the SMS in a particular specified format.

7. REFERENCES

The sites which were used while doing this project:

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4. PIC Microcontroller Manual – Microchip.
5. Embedded C –Michael.J.Pont.