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WIRELESS ELECTRIC VEHICLE CHARGING

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Abstract: This paper describes design of solar powered charging station for charging of electric vehicle that solves the key downside of fuel and pollution. Electric vehicles have now hit the road worldwide and are slowly growing in numbers. Apart from environmental benefits electric vehicles have also proven helpful in reducing cost of travel by replacing fuel by electricity which is way cheaper. Well here we develop an EV charging system that solves with a unique innovative solution. This EV charging of vehicles without any wires, no need of stop for charging, vehicle charges while moving, solar power for keeping the charging system going, no external power supply needed. The system makes use of a solar panel, battery, regulator circuitry, copper coils to develop the system. The system demonstrates how electric vehicles can be charged while moving on the road, eliminating the need to stop for charging. Thus the system demonstrates a solar powered wireless charging system for electric vehicles that can be integrated in the road.

Keywords – Solar, Transmitter, Receiver, Transistor, Electric Vehicle (EV).

I. INTRODUCTION

Solar energy has emerged as one of the most difficult sources of power. In fact, solar energy is used in numerous home, commercial, and industrial applications. Furthermore, a vital component of meeting the goal of reducing carbon emissions is sustainable energy. The usage of electric vehicles (EVs) is a possible option because conventional automobiles, on the other hand, constitute a significant source of pollution. The cost of batteries and the limited range have prevented EVs from making any progress thus far. [1] It is better to charge electric vehicles using renewable energy sources, such as solar energy, for a variety of reasons, including environmental and financial factors. [2] Due to lower carbon dioxide emissions and rising fossil fuel prices, electric vehicles are now more affordable than those with internal combustion engines. Unfortunately, due to several issues including high car costs, the EV was not generally embraced into the market. [3] Limited infrastructure for charging and all-electric drives. EVs are automobiles that run entirely or mostly on electricity. Electric vehicles are particularly environmentally friendly because they consume little to no fossil fuels, have fewer moving components that need to be maintained, and have minimal operating expenses. [4]

II. METHODOLOGY

Over the past year's, solar energy has gained in popularity because of it is a natural source of energy and also it can be used as fuel without the risk of emission of harmful gasses. And hence we are using solar energy in our project as a source of fuel. Solar panel captures the solar energy and stores it inside a battery which will act as a direct current (DC) source for the supply.

This DC source is now applied to the transmitter section. The transmitter section converts DC supply to alternate current (AC). It is then passes to transmitting coil which carries it forward to receiving coil via magnetic induction.

The receiving coil is connected to the receiver section. Here basically AC is converted back into DC and is stabilized for charging. The output is then connect to the electric vehicle charger.

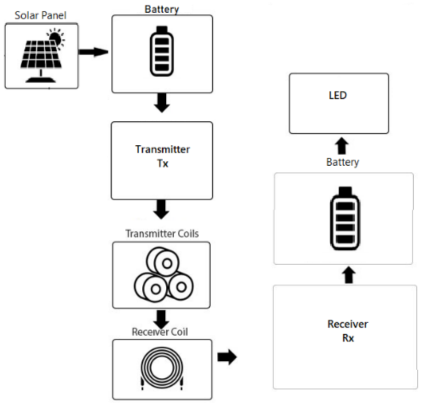

Fig.1: Block Diagram

2.1 Hardware Requirement

2.1.1 Solar Panel:-

A solar cell panel, solar electric panel, or solar panel, also known as a photo-voltaic (PV) module or PV panel, is an assembly of photovoltaic solar cells mounted in a (usually rectangular) frame. Solar panels capture sunlight as a source of radiant energy, which is converted into electric energy in the form of direct current (DC) electricity. Thin-film solar cells are made by depositing one or more thin layers (thin films or TFs) of photovoltaic material onto a substrate, such as glass, plastic or metal.

Fig.2: Solar Panel

2.1.2 Bridge Rectifier:-

A bridge rectifier is an electronic component that converts an alternating current (AC) input into a direct current (DC) output. It is a type of rectifier that uses four diodes arranged in a bridge configuration to rectify the AC voltage. A bridge rectifier has four terminals: two for the AC input voltage and two for the DC output voltage. The AC voltage is applied to the two input terminals, and the rectifier diodes allow current to flow in only one direction, producing a pulsating DC output voltage. The pulsations in the DC output voltage are then filtered by a capacitor or other filtering components to produce a smooth, continuous DC voltage.

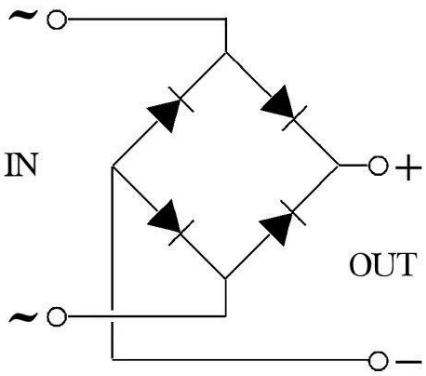

Fig.3: Bridge Rectifier

2.1.3 IC 7805:-

The IC 7805 is a voltage regulator integrated circuit that regulates the voltage and provides a stable DC output of +5 volts. It is a member of the 78xx series of voltage regulators, which includes several other fixed-output voltage regulators. The IC 7805 includes a built-in thermal shutdown circuit that protects it from overheating. It also has built-in overcurrent and short-circuit protection, which prevents damage to the IC and the circuit in which it is used.

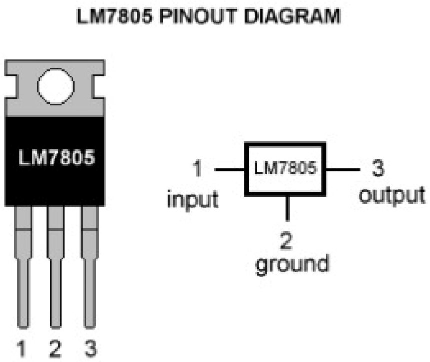

Fig.4: IC 7805

2.1.4 Transistor BD139:-

The transistor is housed in a TO-126 plastic package with three leads that provide electrical connections to the base, emitter, and collector. The base-emitter voltage (V be) of the BD139 is typically 5V and it has a maximum voltage rating of 80V between the collector and emitter. It is also commonly used in power supplies and control circuits due to its ability to switch high currents and handle moderate power levels.

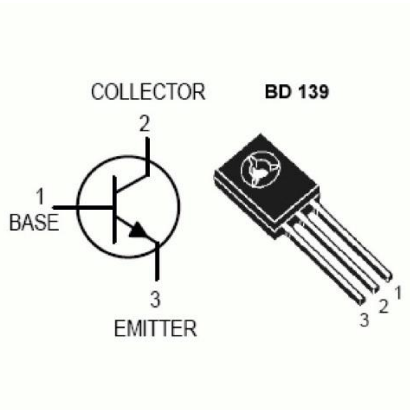

Fig.5: Transistor BD139

2.1.5 Coil:-

An electrical component known as a copper coil is created by winding a length of copper wire into a spiral or helix form. To avoid electrical contact between the coil's individual turns, the wire is normally covered with an insulation layer.The size, shape, and number of turns in a copper coil, as well as the characteristics of the wire used to build the coil, all have an impact on how well it performs. These variables can be changed to produce a coil with certain electrical properties, such as a particular resonant frequency or amount of inductance.

Fig.6: Transmitting Coil

Fig.7: Receiving Coil

No.	Distance(mm)	Voltage(V)
1	0	5.27
2	25	4.94
3	50	4.63
4	75	4.25
5	100	3.48
6	125	2.98
7	150	2.88
8	175	2.77

Table.1: Distance and Voltage between Two Coils (I/P voltage- 7.62V)

2.1.6 Battery:-

A rechargeable battery, storage battery, or secondary cell is a type of electrical battery which can be charged, discharged into a load, and recharged many times, as opposed to a disposable or primary battery, which is supplied fully charged and discarded after use. It is composed of one or more electrochemical cells.

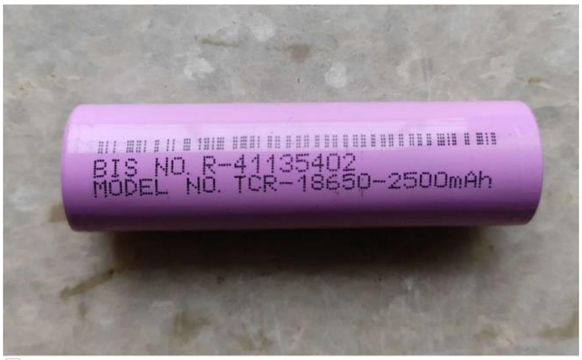

Fig.8: Battery

III. HARDWARE IMPLEMENTATION

1. Transmitting Section:-

The circuit shown in the Figure 9 is intended to generate high frequency magnetic flux. The coil's diameter and number of loops are crucial. In my situation, the diameter for my tests was 6 cm, and I utilized 5 loops with a center tap in the middle. 20 SWG enamelled copper is used to make the center-tapped coil. With the aid of R1, C1, and C2 Resonator components, the BD139 NPN transistor operates as a Switching device and oscillates high frequency signals. The LED is just for indication that the circuit is powered on.

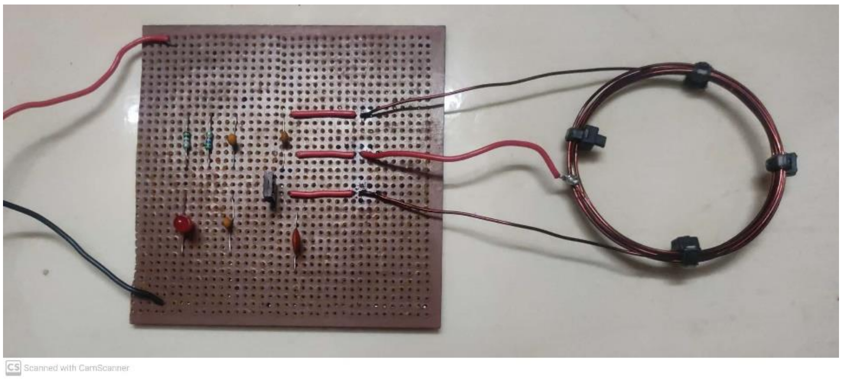

Fig.9: Transmitting Section

2. Receiving Section:-

The circuit shown in the Figure 10 the bridge rectifier (1N4007 X 4) is connected to the 20 SWG enamelled copper wire, 6cm diameter, 15 turns coil, and filter capacitors C1, C2, and C3 are then connected across the output terminals of the 2 bridge rectifier. Finally, the IC 7805 positive voltage regulator regulates the DC supply from the rectifier, and the output supply is ready to charge your devices.

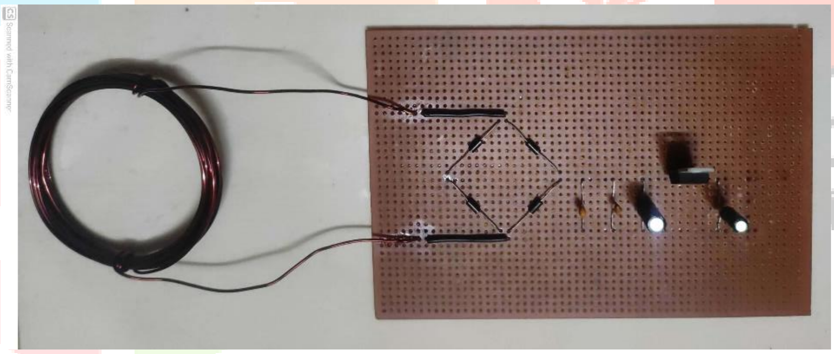

Fig.10: Receiving section

IV. WORKING

The project uses a solar energy as a source of power and an EV as a charging device. Firstly solar panel captures solar energy which is stored in a battery. This will act as a DC source to the circuit. This DC source is then provided to the transmitting section. The transmitter section has an LED that ensures sufficient current has been supplied. Now we need to convert DC into AC so that magnetic induction can happens and current transfers from one coil to another. For that the transmitting section has BD139 transistor. The BD139 NPN transistor reacts as a switching device and oscillates high frequency signal with the help of R1, C1 and C2 Resonator elements. The AC current is passed to the transmitting coil, which generates a maximum magnetic field in the middle of the loop. The transmitting coil is center tapped and has 6 turns in total with a diameter of 6cm.

Now using the Faraday's Law of Induction we transfer the current to the receiving coil. Faraday's Law of Induction states that the magnitude of the emf induced in a circuit is proportional to the rate of change with time of the magnetic flux. The receiving coil consists of 16 turns in total with a diameter of 6cm. The receiving coil is now connected to the receiver section. Now we need to convert that AC back into DC as battery charges only at DC. So in order to obtain that the receiving coil is connected to the bridge rectifier. However, the output voltage of the bridge rectifier is not constant and has a significant ripple component due to the unfiltered pulsating DC waveform. So in order to resolve this problem IC7805 is used. The stabilized DC voltage is now passed to the battery so that it gets charged. An LED is used to display that charging has been initiated. Also a battery percentage indicator is used to display when a person needs to charge his vehicle.

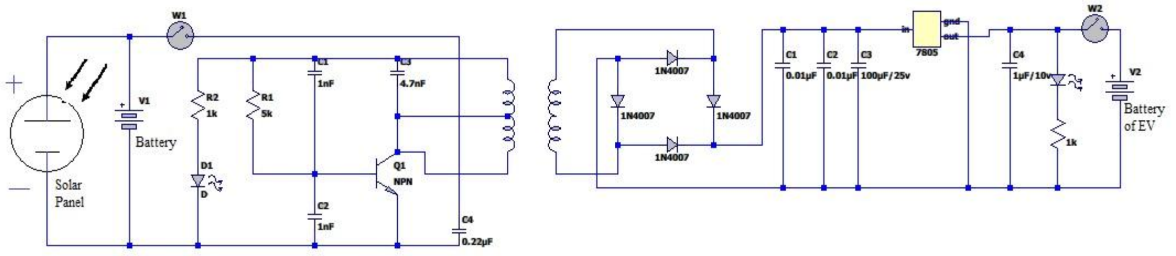

Fig.9: Circuit Diagram

Fig.10: Charging not Initiated

Fig.11: Charging Initiated

V. CONCLUSION

In conclusion, the project "Wireless Electric Vehicle Charging" proposes a novel solution to address the key challenges of fuel and pollution by designing a solar-powered charging station for electric vehicles. The project incorporates an innovative approach to charging electric vehicles wirelessly while in motion, eliminating the need to stop for charging. The system utilizes a solar panel, battery, regulator circuitry, and copper coils to charge the electric vehicles. The proposed solution is an eco-friendly and cost-effective way to charge electric vehicles without the need for an external power supply. The project showcases a successful demonstration of the system, highlighting the feasibility of integrating the solar-powered wireless charging system for electric vehicles into the road infrastructure. Overall, the project presents a significant contribution towards developing sustainable transportation systems for a better future.

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It has been a sincere desire of every individual to get an opportunity to express his views, skills, attitude and talent in which he is proficient so as to give him satisfaction and confidence in his ability to do or produce something useful to mankind. A project is one such avenue through an engineer gives vent to his feeling and expressions. We would like to express our gratitude and appreciation to all those who contributed to the success of this research paper. Firstly, we would like to thank our supervisor Rajesh Morey Sir for providing us with invaluable guidance and support throughout the research process. We would also like to extend our appreciation to the participants who gave their time and valuable feedback for our study. We are also thankful to the International Journal of Creative Research Thoughts (IJCRT) for providing us with the platform to present our work. Lastly, we are grateful to our families and friends for their constant encouragement and support. Without their unwavering support, this research paper would not have been possible.

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