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AUTOMATED SOLAR WIRELESS CHARGING FOR ELECTRIC VEHICLE

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Abstract - *Wireless charging of electric vehicles is an emerging technology that has the potential to revolutionize the way we charge our vehicles. This technology eliminates the need for cords and plugs and allows for convenient and efficient charging. In this paper, we will discuss the concept of wireless charging, its history, working principles, circuits, features, construction and future prospects. 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.*

Key Words: Electric Vehicle, Automatic Wireless Power Transfer, Solar Power System, Dynamic Charging System, Battery Management System (BMS), Automated Solar Wireless Charging for Electric Vehicle

1. INTRODUCTION

Electric vehicles have become more prevalent over the years due to the growing concern over climate change and air pollution. One of the main challenges facing electric vehicles is charging. Charging electric vehicles can be a hassle, requiring the use of cords and plugs. Wireless charging of electric vehicles provides an alternative to traditional charging methods. The idea of wireless charging dates back to the 19th century when Nikola Tesla first proposed the concept of wireless power transfer. Since then, many researchers have been working on developing wireless charging technology for electric vehicles. In 2010, the first wireless charging station for electric vehicles was demonstrated in Berlin, Germany.

1.1 CONSTRUCTIONAL ASPECTS

In transmitter circuit we are using the IC circuit 412 which is power by supply module in reference with t5336 in the below figure 2.1. We ground the terminal 5 of IC 412 and 1, 2, 3 with respect to capacitor of 47 Microfarad and providing 12 Volt input to the circuit to IC 412 with the help of 47k resistor to pin no. 1 and pin no. 8 similarly this 12v also given to pin no. 7 by adding resistance of 47k pin no. 7 and pin no. 3 or pin no. 3 and pin no. 1 of IC 412 are short circuited in between pin no. 1 and 3 we place one capacitor of 1000uf pin no. 2 is connect with 8.2k and resistor to pin no. 1 now pin no. 4 and pin no. 6 are also short and this output send it to IC 5336 at pin no. 4. 12v input is also fed to IC 5336 with the help of 4 capacitor of 393uf to pin no. 8,7,6,5 because it has shorted now, we place the transmitter coil L1 in parallel to those four capacitors.

1.2 Transmitter Circuit

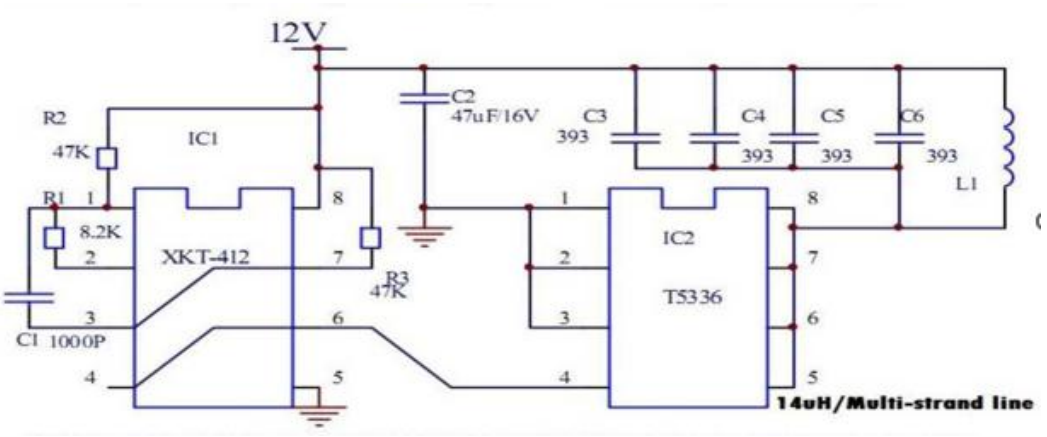


Figure 2.1: Transmitting circuit typical application diagram (12 Volt Output, 5V- 2A Input)

2.2 Receiving Circuit

In receiving circuit as shown in figure 2.2, we ground the terminal 4 and pin no. 8 w.r.t capacitor of 104pf. anode of diode SS34 is connected to ground and anode of the diode is in series with inductor coil to 44.2k and 10k resistor and ground it pin no. 5, 3 and pin no. 1 is also connected to this link before 10k resistor and pin no. 1 with capacitor 10nf pin no. 2 and pin no. 7 are shorted with 100k resistance similarly we create a parallel network of receiving coil and capacitor of 15nf with diode SS510 is in series format and again the cathode of diode is connected to capacitor 10uf this whole network further link with pin no. 2 of IC circuit 3169.

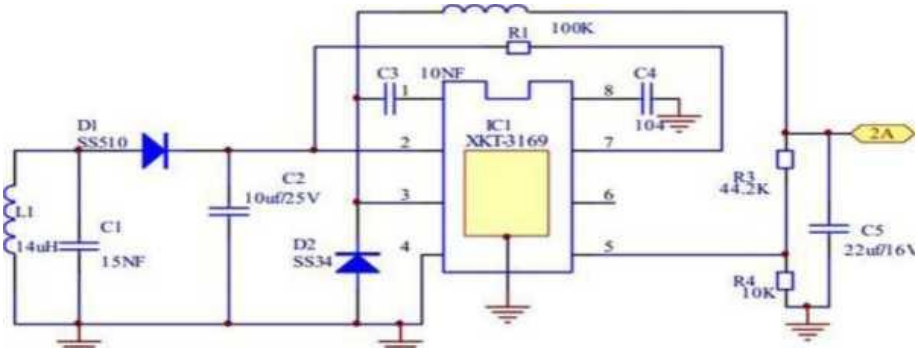


Figure 2.2: Receiving circuit

2.3 WORKING PRINCIPLE

The working principle of wireless charging is based on the principle of electromagnetic induction. When a electric current flows through a conductor, it generates a magnetic field around it. If another conductor is placed in this magnetic field, an electric current is induced in the second conductor. In wireless charging, the charging pad (which is connected to an electrical source) generates an electromagnetic field, which induces a current in the receiver coil of the electric vehicle. This current is then converted to DC power and used to charge the battery of the vehicle.

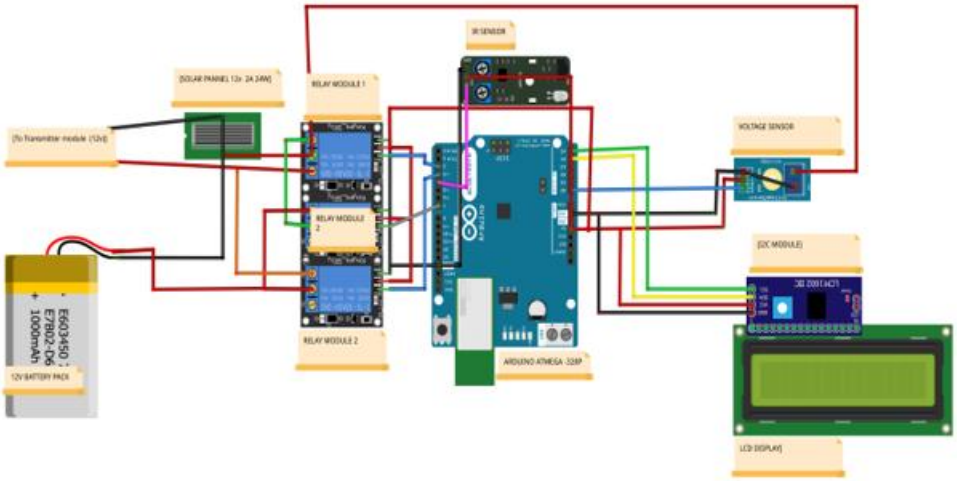
2.4 Construction overview of Relay logic with Respect to PV cell and Transmitting Coil

- Here we used 3 relay which is performing switching actions so that we can direct the power supply to transmitting coil from PV cell and Battery pack or also to charge the battery pack from PV energy those relays come into the scenario and play a vital role.
- Every relay module has 6 terminals in which 3 terminals we used and connected for power supply and as signal we shown in previous construction now remaining three are NO (normally open), NC (normally close) C (common). we Connect solar panel to the C of R1 (Relay1) and NC of R1 connected with transmitting module. Battery pack gets connected to C of R2 (Relay2) and transmitting coil on to the NO.
- But now the problem is when we switch to charge the car from battery pack that time due the reverse voltage, we face the continuous switching between R1 and R2 to overcome this problem we insert the R3 in between those R1 And R2 C of R3 (Relay3) connected to NO of R1 and No of R3 Connected to C of R2.

2.5 How the System is Driven?

- To understand this in deeply manner we must need to go through block diagram.
- When there is sufficient amount of solar energy voltage sensor sense the value of voltage If it is greater than or equals to 10v or simultaneously IR sensor also sense that there is EV for charging (IR=1). Those collected data given to Arduino and Arduino is code in such a way that when IR == 1 && Vin>10 (CHG-ON PV) (Relay1, LOW), (Relay2, LOW), (Relay3, LOW)
- When there is lack of solar energy voltage sensor sense the value of voltage If it is less than o, 10v or simultaneously IR sensor also sense that there is EV for charging (IR=1). Those collected data given to Arduino and Arduino is code in such a way that when IR == 1 && Vin<10 (CHG-ON BV) (Relay1, HIGH); (Relay2, HIGH), (Relay3, LOW).
- The last one is when there is sufficient amount of solar energy and no car onto the station voltage sensor sense the value of voltage If it is greater than 10v or simultaneously IR sensor also sense that there is no EV for charging (IR=0). Those collected data given to Arduino and Arduino is code in such a way that when IR == 0 && Vin>10(BAT-CHG) (Relay1, HIGH); (Relay2, LOW), (Relay3, HIGH).

2.6 SCHEMATIC OF AUTOMATED WIRELESS CHARGING



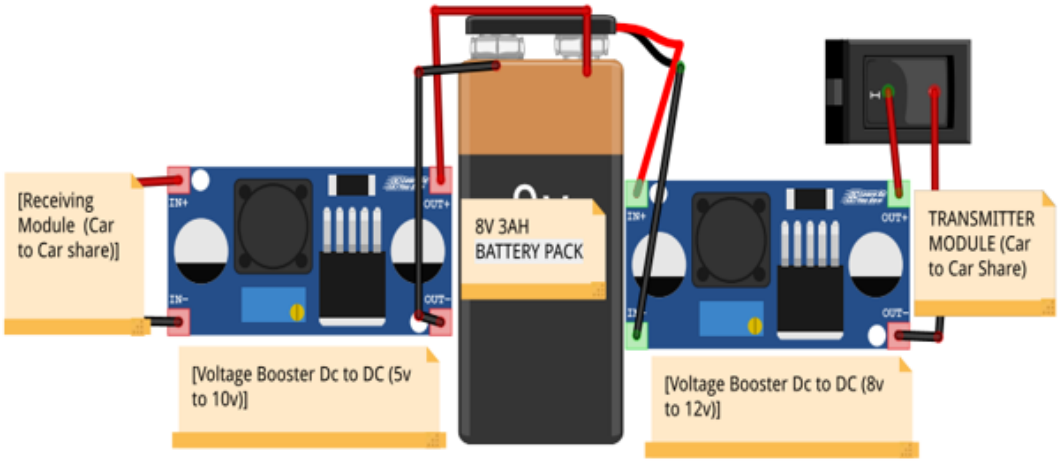
4.1 Construction Overview of Circuit Diagram

Here we used Arduino (atmega 328p) as a microcontroller board who drives all the relay logic according to the conditions and parameter received by the IR and Voltage Sensor and we get the supply voltage at the transmitting coils which transfer the DC power to the Receiver coil which is installed in Car.

We give 5v dc to all the sensors and relay module and ground all the terminals with ARDUINO ground pin and to drive. The Arduino we used is of 5v dc Adapter. S (signal) pin of voltage sensor connect to A0 pin of Arduino and we connect IR sensor to D4 ping of Arduino. Now the s(signal)pin of relay 1 connected to d2, relay 2 to d3 and relay d3 to d7. Assemble I2C module onto the top of LCD display w.r.t 1 to 16pins. There are 4pins of connect Supply pin with 5v and ground to ground SCl to A5 and SDA to A4 of Arduino.

4.2 Concept of Car-to-Car Power Sharing

There are over 10 million ELECTRIC VEHICLES users in the world and as we seen towards the future this figure going to wrap all the market. We have all become hugely dependent on this amazing object and the feeling of it running out of battery is all too familiar that. These devices last, at best, about one full day on a charge and must spend the better part of the evening tethered to a wall. Or in any emergency situation like you stuck on highway with 0% charging then you no need to worry about it because of car-to-car transfer. Unless you are constantly carrying your charger with you it is difficult to keep your EV from dying over the course of a busy day. But what if we could charge our VEHICLE conveniently without having to find a plug and carrying a charger with us at all times? With the proliferation of electric cars one vital piece of technology, first developed about a century ago, is said to significantly improve the way we keep our devices powered.



Here we used two Buck Boost Converter Module (DC to DC) which amplify the dc signal which we further used the charged the battery of the car and share the power to the receiver's car. The receiver side booster converter boosted 5v received dc voltage up to 10v because our battery pack is 8v and to charge this we need 10v dc and while transferring this power to another vehicle again we amplify the 8v to 12v to achieve good range of transmission.

V. RESULT

It eliminates the need for manual charging. Instead, the vehicle can simply park over a wireless charging pad, and the charging process will begin automatically. solar-powered charging stations are environmentally friendly, as they use renewable energy sources. Additionally, the wireless charging process eliminates the need for unsightly charging cables, making the charging process more aesthetically pleasing. Overall, the development of automated solar wireless charging for electric vehicles has the potential to revolutionize the way we charge our cars, making it more convenient and environmentally friendly. However, more research and development are going on for improvement of this project.

VI. CONCLUSION

Wireless charging of electric vehicles is a promising technology that has the potential to revolutionize the way we charge our vehicles. Although it is still in its early stages, the technology is improving rapidly, and it is expected to become more efficient and cost-effective in the future. With the growing concern over climate change and air pollution, wireless charging of electric vehicles could play a significant role in reducing greenhouse gas emissions and improving air quality.

Autonomous wireless charging of electrical vehicle is a revolutionary technology that has the potential to revolutionize the way electric vehicles are charged. It offers a number of benefits, including improved convenience and efficiency, as well as eliminating the risk of electric shock or fire hazards.

The technology is expected to become more efficient, reliable, and cost-effective in the future, as well as becoming more widely available. Additionally, it is expected to become more user-friendly, with the potential to integrate with other smart technologies.

VII. FUTURE PROSPECT

Wireless Charging of electric vehicles has a bright future, with many companies investing in the technology. As the technology improves, it is expected to become more efficient and cost-effective. The integration of wireless charging stations into the road infrastructure could also lead to increased adoption of electric vehicles. At a fundamental level, electric cars comparatively offer a lower operating cost compared to conventional internal combustion engines. On average, electric vehicles are 75- 80% cheaper from fuel and maintenance perspective, which is an important factor for many consumers who have high usage. This reality holds true across factors because it's materially cheaper to charge a battery compared to refueling a conventional liquid fuel tank

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