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Efficient Battery Charging Techniques by Mutual Induction for Hybrid Electric Moped

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ABSTRACT
The use of battery operated electric vehicles (EVs) has been offered as a double option to decrease fuel energy consumption and greenhouse gas emissions (GHG), in a order to mitigate the hazard to environment and impact of climate change. Recently, there is EV industry has a huge development with their technical characteristics: fuel energy economy, environmental impact and market evolution. , smart charging is a promising technique which would be mitigate the negative impacts of electric vehicle charging However, the essential barrier challenging its implementation is the problem of battery aging This system is totally safe as its reqd electronic devices also. The efficiency of this wireless charger is very high so that we improve the battery charging very efficiently.

***Keywords**: Hybrid electric vehicles, power transfer, wireless, transmitter, battery, IC, mutual induction*

Introduction

Electric vehicles (EV) providing a new era in transportation by reducing emissions, noiseless operation, and the efficient consumption of energy compared to the internal combustion engine (ICE) vehicle, though EV has significant limitations in terms of battery capacity, limitations of long-range travel, long charging time, and cost.

A smart and optimised charging technique will help to the consumer for the energy consumption of EV by mutual induction phenomena as per time of use as well as sharing of charge in the interest of charging cost reduction and increasing energy demand due to EV charging may affect the load balancing of the power system.

The charging infrastructure development may increase the performance criterion. This paper discusses about efficient use of battery techniques method by simple mutual induction phenomena by Tesla.[1-3]

In this paper, there is circuit design is presented which demonstrates the wireless battery charging system.

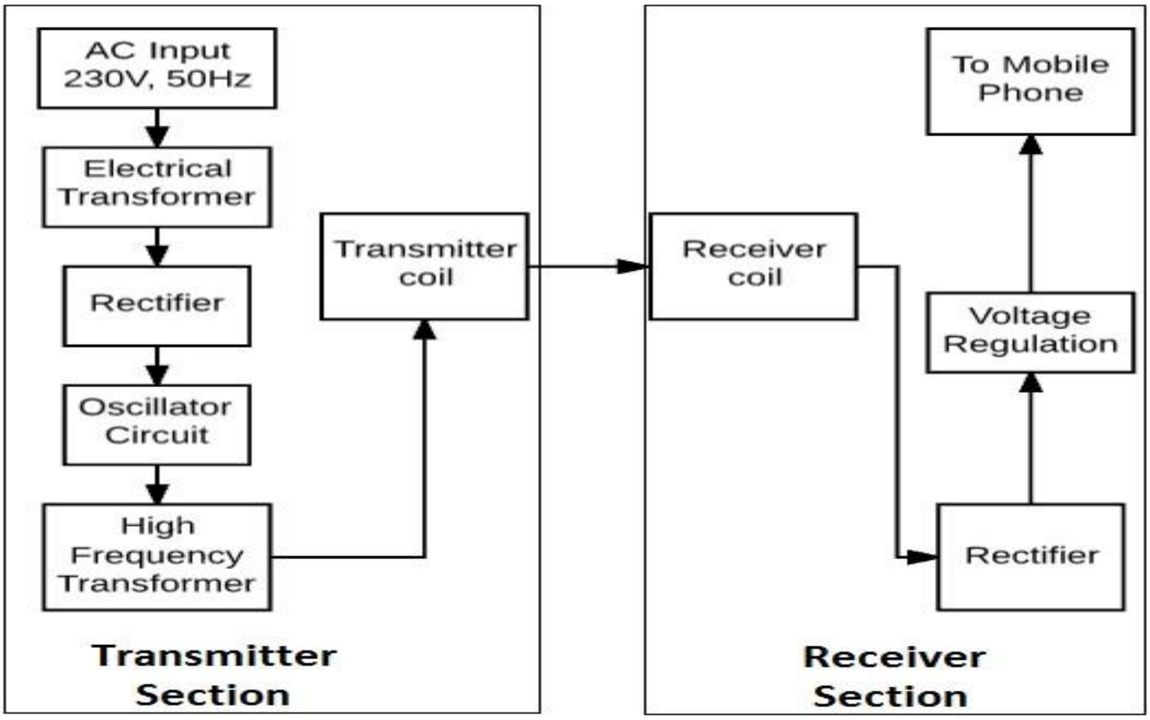
The concept of inductive coupling is utilized to transfer the power wirelessly. Intially the mains input 220V AC is converted to 110V AC using a step-down transformer and then the bridge rectifier converts 110V AC into 110V DC. This 110V DC is then converted to alternating

AC using the oscillator circuit and then it is transmitted using the transmitter coil. At a distance of about 2.3inches, the receiver coil receives alternating voltage 55V to 70V which is then converted to 48V DC and is provided to the battery.

This can further be enhanced by integrating the receiver part into the only so that it can be charged by placing on the charging battery which consists of the transmitter part.

The principle of the electrical transformer is used in inductive charging. With the help of inductively coupled coils, the electrical transformer transfers the electrical energy from one circuit to the other circuit. The varying current in the primary winding creates magnetic flux which is also varying in nature and then magnetic field within the secondary winding.

A varying EMF (electromotive force) is then induced in the secondary coil. This phenomenon is known as "*Mutual Induction*".[4-6]

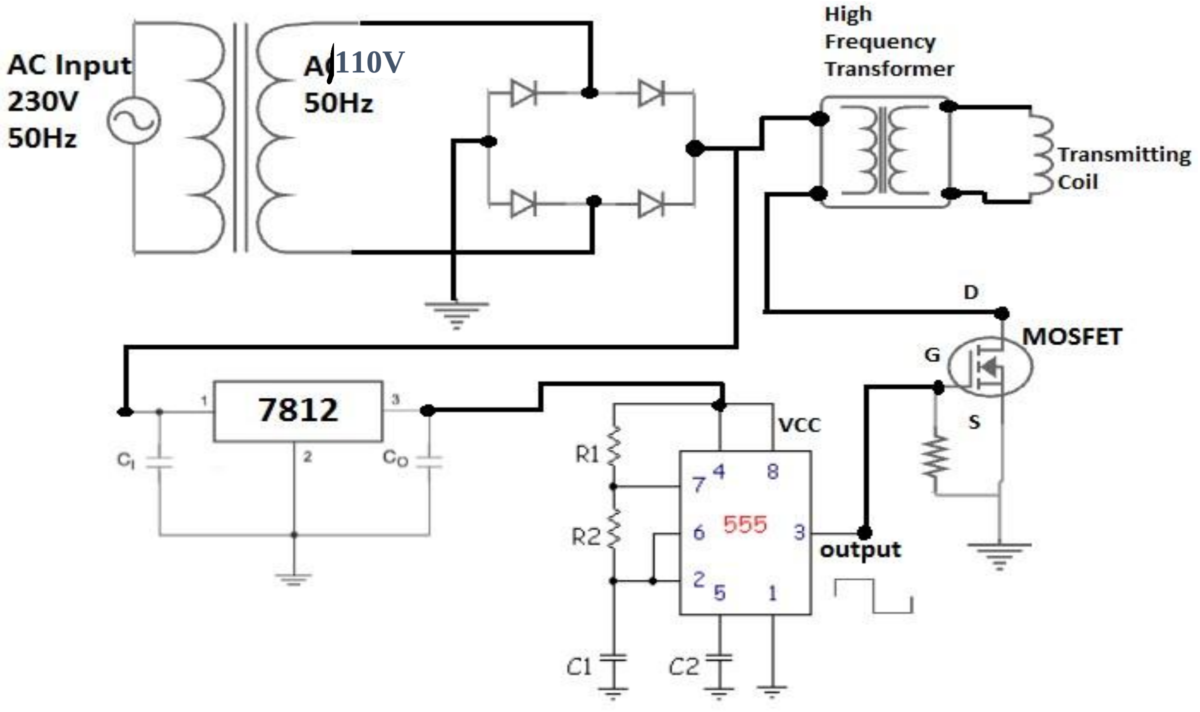


The receiver circuit receives the induced voltage within the receive

Circuit of Transmitter Section

The pulse which is provided to the gate terminal of the power MOSFET to switch the MOSFET at a very high frequency which then converts the 110V DC into alternating pulse of very high frequency and this alternating pulse is transmitted through the transmitter coil to generate varying magnetic flux which further incorporates magnetic field and induces the voltage in the receiver coil.

The voltage regulator IC (Integrated Circuit) LM7812 is used to provide +48V to the VCC terminal of the NE555 Timer IC.



In above figure, Timer IC 555 is used to generate very high frequency of 864MHz and other parameters use as follows are:

- R1 = 12.816 ohms (Ω)
- R2 = 15.39 ohms (Ω)
- C1 = 46microfarad (µF)
- Frequency = 864 KHz
- Duty Cycle = 52%
- Time High = 73.344 seconds (s)
- Time Low = 49 seconds (s)

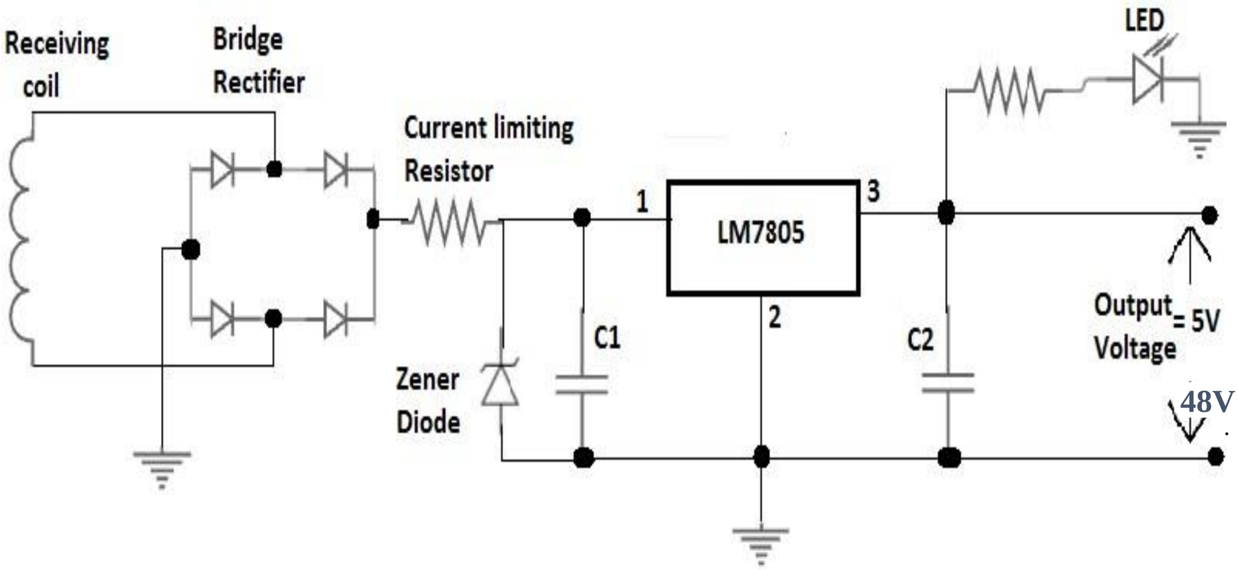
The different sections of the block diagram are explained below:-

- AC mains input is provided which is equivalent to 220V, 50Hz AC (Alternating Current).
- The step-down electrical transformer converts the 220V, 50Hz AC into 110V, 50Hz AC.
- The rectifier converts the AC into DC (Direct Current).
- This 110V DC is then converted to high frequency alternating pulse using the high frequency transformer. The oscillator circuit is used to generate the high frequency pulse using 555 Timer IC.
- The output of the high - frequency transformer is then transmitted using the transmitter coil which further induces varying electromotive force or voltage in the receiver coil.
- This voltage is filtered and rectified using the rectifier (converted into DC).
- The voltage regulator is used to regulate the voltage to 48V which is then provided for charging the battery.

Circuit of Receiver Section

The receiver circuit receives the induced voltage within the receiving coil which is also varying or alternating in nature. This voltage or induced EMF (electromotive force) is then rectified with the help of bridge rectifier which is nothing but the combination of four diodes; this converts the AC voltage into the DC voltage. The voltage regulator circuit firstly includes the zener diode which is used to regulate the voltage in combination with a current limiting resistor.

Further, the voltage regulator IC (Integrated Circuit) LM7805 is used to get the output equivalent to 48V. This voltage is used to charge the battery charging of hybrid vehicle



FUTURE DEVELOPMENT

In this process of wireless power transfer which will definitely enhance the efficiency of the system. The procedure of inductive coupling can be supplanted with the microwave innovation or for certain different techniques to expand the result and diminish the misfortune. The battery charging system's efficiency will improve as a result of this.

CONCLUSION

The wireless energy transfer by inductive coupling is explained in this paper. When the distance between the transmitter and receiver sections is 2.3 inches, this circuit design provides V output to the hybrid vehicle's battery, which is then regulated to 55V to 70V V. In order to transform the DC energy into alternating AC, the 555 Timer IC generates a pulse with a duty cycle of approximately 52% and a frequency of 864 MHz. This pulse is then delivered to the gate terminal of the MOSFET.

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