A New method of designing an integrated filtered Wireless power transmission for Electric vehicles

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ABSTRACT:

Automation has created a bigger hype in the electronics. 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. 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 system aim s at designing an integrated Cockcroft-watton generator system which contains the power transmission units and power receiving units. At the level of receiving side we are collecting the power frequency and after regulation we can charge it in to the battery. This concept suggests using watton method as power regulation unit

Keywords:

Copper coils, transformers, pulse generators, MOSFETS, battery, capacitors.

I INTRODUCTION:

Electromagnetic fields (EMF) are invisible and do exists everywhere on Earth. There are many types of EMF and no single instrument can measure them all. The most common form of wireless power transmission is carried out using direct induction followed by resonant magnetic induction. 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 present system is designed like from 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.

A pulse generator is either an electronic circuit or a piece of electronic test equipment used to generate rectangular pulses. A new class of pulse generator offers both multiple input trigger connections and multiple output connections. Multiple input triggers allow experimenters to synchronize both trigger events and data acquisition events using the same timing controller. In general, generators for pulses with widths over a few microseconds employ digital counters for timing these pulses, while widths between approximately 1 nanosecond and several microseconds are typically generated by analog techniques such as RC (resistor-capacitor) networks or switched delay lines.

An ultra-short pulse generator is presented, whose frequency, pulse width and amplitude are tunable. The design method is based on Marx circuit, which is made up of avalanche transistors mainly. The paper describes the avalanche transistor's characteristic, the basic pulse circuit, the generator's working principle and the selection of components in detail. Finally, the simulation and experimental results are shown and they are in accordance with each other perfectly. With the features such as simple structure, stable and reliable performance and low cost, the ultra-short pulse generator can be applied in ultra-wideband wireless communication system.

Features:

1. 100 kHz High Voltage Pulse Generator

2. up to a 100V output into 4 kohm,

3. Floating output, Adjustable Rise/Fall time, Delay time, and External trigger input.

4. For TM series chassis

Applications:

Pulses can then be injected into a device under test and used as a stimulus or clock signal or analyzed as they progress through the device, confirming the proper operation of the device or pinpointing a fault in the device. Pulse generators are also used to drive devices such as switches, lasers and optical components, modulators; intensifiers as well as resistive loads. The output of a pulse generator may also be used as the modulation signal for a signal generator. Non-electronic applications include those in material science, medical, physics and chemistry.

II. RELATED WORK:

This technical improvement together with the need for high performance wireless power transmission for electric vehicle created faster, more accurate and more intelligent advanced power control algorithms. This project describes a new economical solution for a filtered wireless power transmission for vehicle integrated control systems.

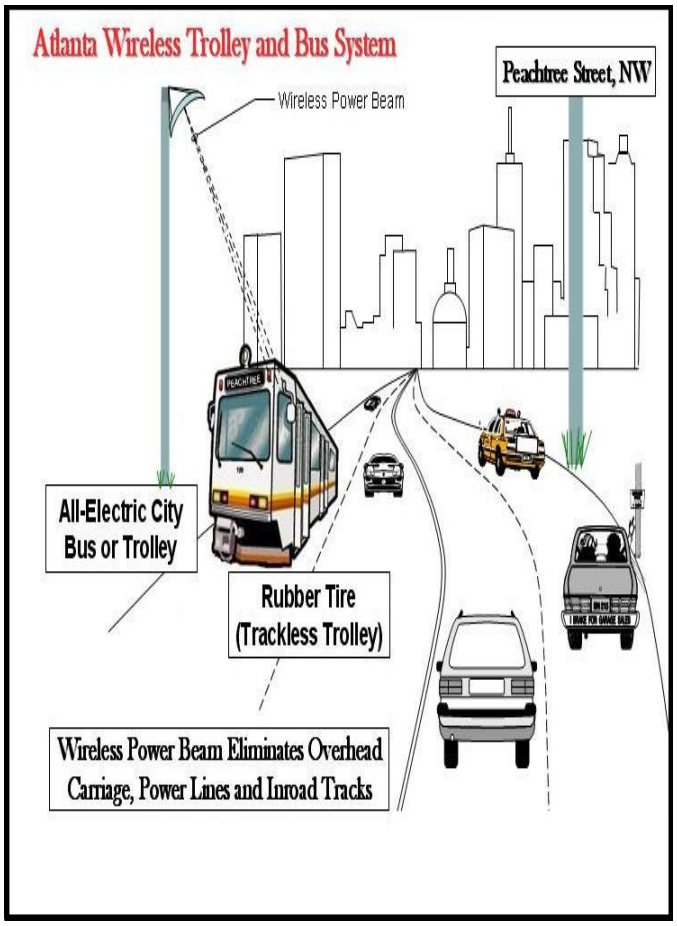

Fig I: Model of Wireless Power transmission for Electric vehicles

The paper presents a system which mainly consists of pulse generator unit, capacitors, 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.

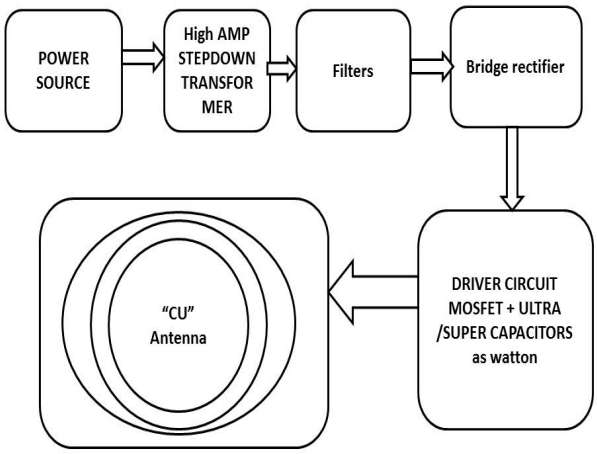

Fig II: Block diagram of Transmitter section of working model.

This proposed system 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. We mainly use transformer, RPS, Pulse Generator, a pair of copper coils, rectifier, filter and a load.

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.

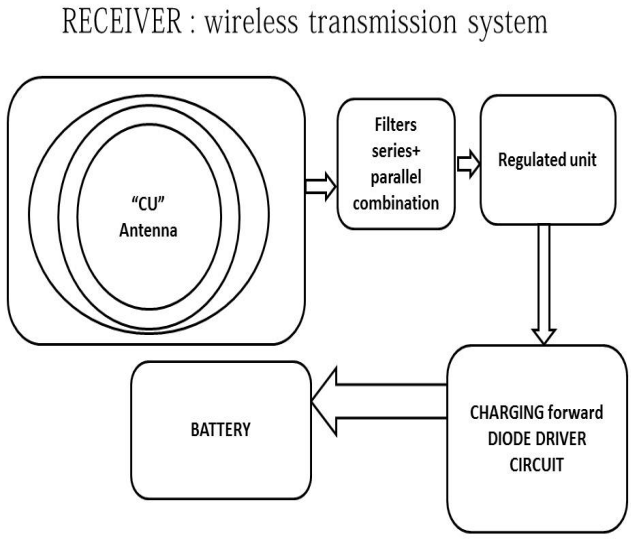

Fig III: Block diagram of Receiver section of working model

The presented paper describes the power transmission under six basic parts: the pulse generator, sending coil, receiving coil, rectifier, regulator, and load. The copper coil, illustrated by object A, is a single loop of insulated copper wire. The sending coil and receiving coil are illustrated by objects B and C respectively. These coils of copper tubing are made to be exactly the same so they resonate at the same frequency. The pick-up is object D and is connected in series to a load. The resonant frequency of our coils, at which we get the most power, varies with the distance between the coils.

Due to this we chose to use a frequency generator so that we could adjust the frequency as needed. Several oscillators were built to generate certain frequencies, but due to the varying nature of our resonant frequency, the frequency generator like pulse generator was used. A frequency generator outputs a signal of the same frequency as the resonant frequency of our copper coils, because we can output maximum power at this frequency.

The signal generated is put into our driving loop of 10 gauge wire. The loop is just smaller than our primary coil (approximately 55.5 cm in diameter). The AC current in the driving loop causes the loop of wire to behave like a dipole. The driving loop is positioned parallel to the primary coil, as close as possible. The flux generated by the driving loop through the primary coil causes the coil to resonate.

It is important to realize that the driving loop does not make the secondary loop resonate directly. The evanescent waves emitted by the primary coil causes the secondary coil to resonate, because the coils are of the same shape, size, and mass (or close to identical). Both the

III. HARDWARE DESIGN FOR PROPOSED METHODOLOGY:

In the proposed system we introduce a "wireless power", 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. This concept is for power transmission system, from which we can use for wireless power chargers, transporters units like bus… etc. wireless power receiving at the electric vehicle like buses, trains, motor bikes etc. Here transmission part can fix under the road by the primary coil and the secondary

coil are made of copper tubing that is 1/4 inch inner diameter (3/8 inch outer diameter). The coils use 60 feet of tubing each, and have about 10 turns (57.5 cm in diameter). At this point the two coils are parallel to each other and resonating, using only enough power to make the driving loop "drive" the first coil. The distance between the primary and secondary coils determines the magnitude of power that is transmitted.

The power exponentially decays as the coils are moved further apart. When the secondary coil vibrates at its resonant frequency, a stronger magnetic field is generated. The receiving loop of 10 gauge wire is situated parallel to the secondary coil, as close as possible. The magnetic flux from the secondary coil induces a current in the receiving loop, which drives a resistive load.

The presented paper describes the power transmission under six basic parts: the pulse generator, sending coil, receiving coil, rectifier, regulator, and load. The copper coil, illustrated by object A, is a single loop of insulated copper wire. The sending coil and receiving coil are illustrated by objects B and C respectively. These coils of copper tubing are made to be exactly the same so they resonate at the same frequency. The pick-up is object D and is connected in series to a load.

way vehicles contains the receiving coil under the body with respected circuit, then it and charge the vehicle's battery. In this project we are using transformer, RPS, Pulse Generator, a pair of copper coils, rectifier, filter and a load We use Power supply at transmitter section which is used for supplying electrical or other types of energy to an output load or group of loads is called a power supply unit or PSU. The term is most commonly applied to electrical energy supplies, less often to mechanical ones, and rarely to others.

A power supply may include a power distribution system as well as primary or secondary sources of energy such as Conversion of one form of electrical power to another desired form and voltage, typically involving converting AC line voltage to a well-regulated lower-voltage DC for electronic devices. Low voltage, low power DC power supply units are commonly integrated with the devices they supply, such as computers and household electronics.

The process of transforming energy from one device to another is called transformation. For transforming energy we use transformers. s A transformer is a device that transfers electrical energy from one circuit to another through inductively coupled conductors without changing its frequency.

A varying current in the first or primary winding creates a varying magnetic flux in the transformer's core, and thus a varying magnetic field through the secondary winding. This varying magnetic field induces a varying electromotive force (EMF) or "voltage" in the secondary winding. This effect is called mutual induction. A pulse generator is either an electronic circuit or a piece of electronic test equipment used to generate rectangular pulses. The types of pulse generators:

Optical pulse generators:

Light pulse generators are the optical equivalent to electrical pulse generators with rep rate, delay, and width and amplitude control. The output in this case is light typically from a LED or laser diode.

Multiple-channels:

A new family of pulse generators can produce multiple-channels of independent widths and delays and independent outputs and polarities. Often called digital delay/pulse generators, the newest designs even offer differing repetition rates with each channel. These digital delay generators are useful in synchronizing, delaying, gating and triggering multiple devices usually with respect to one event. One is also able to multiplex the timing of several channels onto one channel in order to trigger or even gate the same device multiple times. The generation of the energy pulse has been accomplished by using at least two power electronics modules, namely:

(1) A high voltage power supply (HVPS) that provides a current-controlled output used to charge external energy storage capacitors over a relatively long period of time;

(2) A power modulator that draws upon the energy storage capacitors to develop a very fast, high power electrical pulse

The wireless energy transfer system is also dependent on the Mosfets, this necessity becomes completely insignificant. As can be seen in the given diagram, the AMV stage is instantly preceded by the relevant gates of the mosfets, because mosfets have very high input resistance, which means the AMV transistors wouldn't be unnecessarily loaded and therefore the frequency from the AMV wouldn't be distorted due to the integration of the power devices. The mosfets are alternately switched, which in turn switches the battery voltage/current inside the secondary winding of the transformer. The output of the transformer gets saturated delivering the expected 220V to the connected loads.

IV. CONCLUSION:

In conclusion this paper has provided an initial analysis into a new era of implementing an integrated wireless power transfer technology and provided realistic opportunity for system optimization and green transportation. This technical improvement together with the need for high performance wireless charging of vehicles created faster, more accurate and more intelligent and advanced power control algorithms. This project describes a new economical solution of intra wireless power transmission techniques for integrated green transportation systems.

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. We conclude that designing an integrated Cockcroft-watton generator based system which contains the power transmission units and power receiving units. At the level of receiving side we are collecting the power frequency and after regulation we can charge it in to the battery.

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