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INSTANT ELECTRIC POWER TRANNY TOGETHER WITH SELF-REGULATED PRODUCTION VOLTAGE PERTAINING IN WIRELESS POWER TRANSFER

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ABSTRACT:

This paper proposes a novel resonator structure for efficiency and transferred power improvements: a transmitter (a receiver) that consists of two strongly coupled resonators. The two strongly coupled resonators are embedded within a transmitter device (a receiver device) and behave as a single resonator with enhanced performances. Unlike the conventional four-coil system, the first and the fourth resonators are also designed to have high loaded-Q and maximum cross couplings. Therefore, the first and the fourth resonators also take part in the coupled resonance with opposite-side resonators. This provides additional energy exchange path. The exact design guidelines are provided for each different resonance topology from analytical derivation. It is analyzed and experimentally demonstrated that the efficiency and the transferred power are increased by the proposed two-resonator technique. For a 30 cm × 25 cm parallel-resonant transmitter and an 18 cm × 16 cm parallel-resonant receiver at 13-cm distance, the efficiency and the transferred power with the proposed technique are 65.2% and 17.2 W, respectively, whereas those values without the proposed technique are only 37.3% and 6.2 W.

I. INTRODUCTION

WIRELESS power transfer technology is able to transmit electrical energy without direct wire connection. To enable this, a typical wireless power system consists of a dc–ac resonant inverter, a resonator link, an RX rectifier, and an RX regulator. While all of these blocks are important, the unique characteristic of wireless power system comes from the loosely coupled resonator link. The TX resonant inverter, the RX rectifier, and the dc–dc regulator can be designed to have efficiency values higher than ~90%. The efficiency of the loosely coupled TX and RX resonators, on the other hand, is typically very low and has been the limiting factor in attempts to achieve high overall efficiency. Consequently, many efforts have been made to increase the efficiency, even under long distance TX and RX operation. The study utilized a folded cylindrical helix resonator to achieve 40% efficiency at a distance of 39 cm with 10.2-cmresonator diameter. However, the operating frequency is 192 MHz, which is too high for the power conversion circuitry. The novel resonator structure for the wirelessly powered electric vehicle features a long operation distance even with a narrow TX coil width. The works and proposed methods to avoid the frequency splitting problem. When frequency splitting at short distance is overcome, the allowable operating distance variation is increased. However, long-distance performance improvements are still needed. The inconvenience of placing an additional resonator in the free space can be avoided if the additional resonator can be embedded into a transmitter or a receiver. As a result of embedding the additional resonator, a transmitter or a receiver now contains two high-Q resonators. Although the frequency adjustment of allows the repeater position to be close to TX or RX, the idea of placing the additional resonator at the same location with TX or RX is not discussed in. The system with an embedded repeater was not characterized and experimented in. The improvement of efficiency and transferred power and the proper design guidelines need to be analyzed. In this paper, the idea of embedding an additional resonator within a TX and/or an RX is proposed. The degree of efficiency improvement is analyzed. The analytic derivations are carried out for all the four resonance topologies (i.e., series- or parallel resonant TX or RX), and the design guidelines are provided for each topology based on these analyses.

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II. REVIEW OF BASIC WIRELESS POWER SYSTEMS

The coupling *k* between the transmitter and receiver is typically less than 0.1 in a loosely coupled wireless power system. However, a large amount of power can be transmitted even under the small coupling because the energy stored in coupling resonators is larger than the transmitting power. Due to the high energy stored in the resonators, even a small parasitic resistance in the resonators significantly degrades the overall efficiency. While the wireless power systems can be analyzed using electromagnetic field theory the circuit analysis approach is used in this paper. Here we are going to see Medical Implantable Applications using WPT (Wireless Power Transfer). AC supply will be given HF (High Frequency) Transformer, so that Transformer can produce high magnetic flex in the primary side. It will be transferred to secondary side and using filters it is given to DC regulator with help of regulator, supply will be given to Microcontroller. And we can see the blood pressure values in LCD.

III. SYSTEM DESIGN

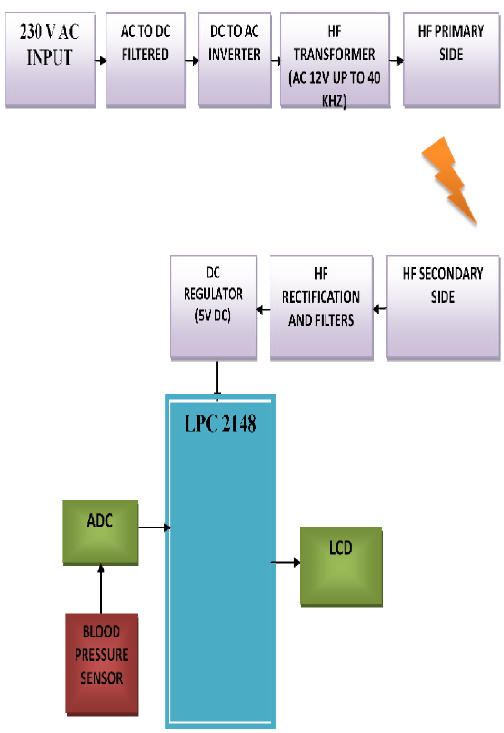
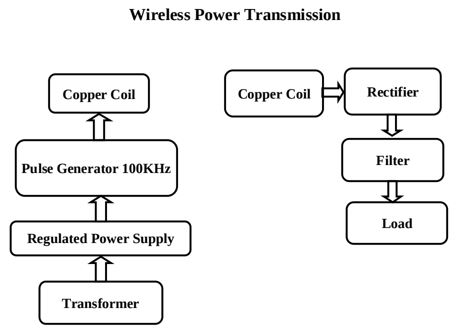


Fig: Block Diagram

IV.HARDWARE DESIGN:

A transmitter or a receiver consisting of two strongly coupled resonators for enhanced resonant coupling in wireless power transfer consists of following hardware modules are inverter, transformer, rectifier, regulator, ADC, LCD and blood pressure sensor.

WIRELESS POWER TRANSORMATION



TRANSFORMER

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.

REGULATED POWER SUPPLY

Power supply is a supply of electrical power. A device or system that supplies 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.

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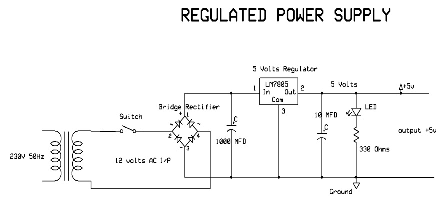

PULSE GENERATOR

A **pulse generator** is either an electronic circuit *or* a piece of electronic test equipment used to generate rectangular pulses.

This is a simple pulse generator to use for testing purposes. It uses the LM324 operational amplifier, and the frequency can be controlled with a potentiometer. The LM324 chip is not that fast, so the frequency will be limited. The frequency range for this with C1=33nF is about 10 Hz to 6kHz. If you replace the capacitor with a 10nF, it will go up to about 11 kHz. But the waveform will suffer, as it will be more like a triangle wave. It will produce an output of 5V peak.

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 transfer's 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.

RECTIFICATION

The process of converting an alternating current to a pulsating direct current is called as rectification. For rectification purpose we use rectifiers.

RECTIFIERS

A rectifier is an electrical device that converts alternating current (AC) to direct current (DC), a process known as rectification. Rectifiers have many uses including as components of power supplies and as detectors of radio signals. Rectifiers may be made of solid-state diodes, vacuum tube diodes, mercury arc valves, and other components.

FILTRATION

The process of converting a pulsating direct current to a pure direct current using filters is called as filtration.

FILTERS

Electronic filters are electronic circuits, which perform signal-processing functions, specifically to remove unwanted frequency components from the signal, to enhance wanted ones.

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.

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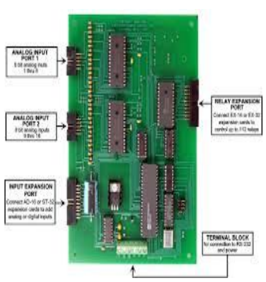
VOLTAGE REGULATOR:

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 is not possible to obtain a voltage lower than the stated rating. 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 shows voltage regulator.

Fig: Voltage Regulator

ADC

An analog to digital converter is a device that converts a continuous physical quantity to digital number that represents the quantity's amplitude. The conversation involves quantization of the input, so it introduces a small amount of error. Instead of doing a single conversion, an ADC often performs the conversions periodically.



BLOOD PRESSURE SENSOR

The PS-2207 Blood Pressure Sensor uses an oscillometric method to calculate the systolic and diastolic blood pressure of a subject. This is the most common method for automated blood pressure measurements because the method is non-invasive and simpler to automate than the traditional ascultatory method, which typically requires a carefully trained practitioner to give accurate results.

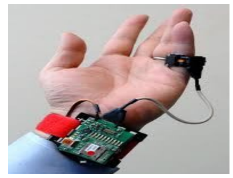


Fig: Blood pressure sensor

V. CONCLUSION

This paper has proposed that the efficiency and the transmitted power are improved by a transmitter (a receiver) that consists of two strongly coupled resonators. The two resonators are closely placed to each other within a single transmitter device (a receiver device). Unlike the conventional four-coil system, the first and the fourth resonators have high loaded-Q and maximum diameter. Therefore, these resonators also take part in the direct energy exchange between TX and RX. Since all of the two resonators within a device have high loaded-Q and the coupling within a device is high, frequency splitting within a TX or within an RX occurs. The required frequency adjustment is also discussed. For a parallel-resonant transmitter, the proposed technique improves both the efficiency and the transmitted power simultaneously. This resolves the trade off between high efficiency and high transmitted power. For a parallel-resonant receiver, the proposed technique boosts the reflected resistance without degrading the receiver internal efficiency. Therefore, the upper limit of the maximum allowable reflected resistance is increased under the given parasitic of the receiver resonator. For series-resonant topology, the two-resonator technique improves the reflected resistance and efficiency, whereas the total resonator size is kept small. This idea of constructing a transmitter (a receiver) as two adjacent resonators can be universally applied to general magnetically coupled wireless power transfer systems. The proposed scheme is specifically beneficial for the systems when the TX-to-RX coupling is small and the intermediate additional repeaters are not allowed in the free space between TX and RX. One example is the

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battery charging for portable electronic devices, where the TX-to-RX coupling is small due to their small size. The concept can be also applied to the wirelessly powered biomedical implant. The TX-to-RX coupling here is also very small, and moreover, there is skin tissue at the free space between TX and RX, which makes it harder to insert conventional repeaters.

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