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Cordless Power Transfer

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ABSTRACT

The main aim of this project is to develop a system for wireless power transfer for medical applications. Pacemakers have become so popular for its size and flexibility that it had become a life line for heart patients. A pace maker is an electronic device (that works in place of a defective heart valve) which is implanted in a patient body that runs on a battery. The patient is required to undergo surgery every year to replace the battery. This project is designed to charge a rechargeable battery of the pace maker wirelessly, thus avoiding the need for a surgery every year. This device uses low-energy electrical pulses to prompt the heart to beat at a normal rate.

Keywords: Pacemakers, Wireless, Science, Engineering and Technology

I. INTRODUCTION

The transfer of electricity from source to the place it is consumed without any conducting wire or cable is called Cordless Power Transmission. It is also widely known as wireless transfer of electricity. The concept of wireless power transfer was first realized by Nikola Tesla in 19th century. Wireless power transfer can bring a remarkable revolution in the field of the electrical engineering which eliminates the usage of conventional copper cables and wires.

Day by day new technologies are working to make our life as simple as possible. Wireless charging through induction and resonance transfer could be one of the next emerging technologies that bring the future nearer. This could make the upcoming generations less reliable on wires. In this project we are going to show that it is practically possible to charge low power devices wirelessly via inductive coupling though its efficiency is a not so appreciable. From this project we are going to learn the difficulties and various possibilities in this field. This is most emerging topic in this world today. we are basically using this method to charge devices kept far apart and solving the problem of sitting at one place until your device gets charged. It minimizes the complexity that arises for the use of conventional wire system. In addition, the project also opens up new possibilities of wireless systems in our other daily life uses. Pacemakers have existed for decades as a means to restore cardiac electrical rhythms. However, lead-related complications have remained a clinical challenge. While market-released leadless devices have addressed some of the issues, their pacer-integrated batteries cause new health risks and functional limitations. Through this project we are more emphasizing on transfer of power for normal ranges. Inductive resonance power transfer enables wireless powering of bioelectronics devices. We also came to know about new technologies emerging recently and which are in research list.

II. BASIC CONCEPT OF WIRELESS POWER TRANSFER

A. Inductive Coupling

Inductive or Magnetic coupling works on the principle of electromagnetism. When a wire is proximity to a magnetic field, it generates a magnetic field in that wire, and thus transferring electrical energy between wires through magnetic fields using faradays electromagnetic induction.

If a portion of the magnetic flux established by one circuit interlinks with the second circuit, then two circuits are coupled magnetically and the energy may be transferred from one circuit to the another circuit.

This energy transfer is possible due to sharing of magnetic fields that is with the exchange of changing flux which has to be common in both circuits

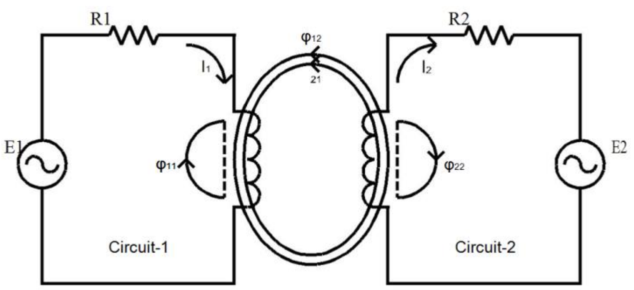

Figure 1. Inductive Coupling with Four Component Fluxes

Power transfer efficiency of inductive coupling can be increased by increasing the number of turns in the coil, the strength of the current, the area of cross-section of the coil and the strength of the radial magnetic field. Magnetic fields decay quickly, making inductive coupling effective at a very short range.

B. Inductive Charging

Inductive charging uses the electromagnetic field to transfer energy between two objects. A charging station sends energy through inductive coupling to an electrical device, which stores the energy in the batteries. Because there is a small gap between the two coils, inductive charging is one kind of short-distance wireless energy transfer.

Induction chargers typically use an induction coil to create an alternating electromagnetic field from within a charging base station, and a second induction coil in the portable device takes power from the electromagnetic field and converts it back into electrical current to charge the battery. The two induction coils in proximity combine to form an electrical transformer.

Greater distances can be achieved when the inductive charging system uses resonant inductive coupling.

III. BLOCK DIAGRAM

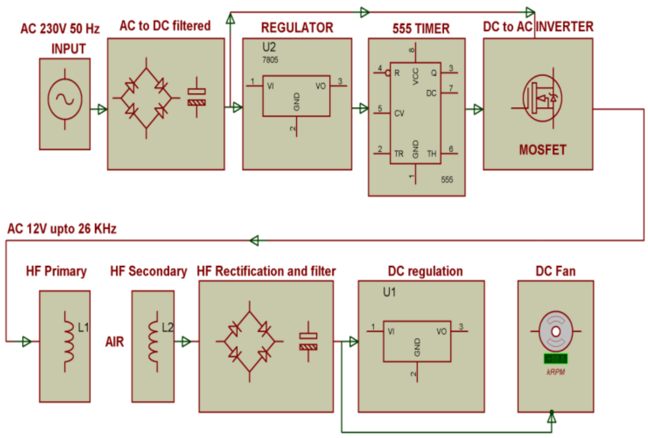

Figure 2. Block Diagram

IV. METHODS AND MATERIALS

As we can see the block diagram consists of the following components:

A. DC power supply:

The D.C. Power Source consists of a simple step down transformer and a rectifier circuit. The transformer steps down the voltage to a desired level and the rectifier circuit convert the A.C. voltage to D.C

B. Oscillator circuit:

The prototype oscillator Circuit designed for the project is a modified Royer oscillator. This oscillator circuit is incredibly simple yet a very powerful design. Very high oscillating current can be achieved with this circuit depending on the semiconductor used. Here high current is necessary to increase the strength of the magnetic field.

C. Transmitter:

In our project, the transmitter coil is to be constructed with around 92 mm diameter, 17 to 18 copper wires and

F. Filter:

We can use capacitor filter to remove ripples present in output of bridge rectifier. After capacitor filter, smooth DC voltage is present at the input of voltage regulator.

V. RESULT AND DISCUSSION

This project is formed out of AC 230V 50Hz to AC 12V at 26 KHz circuit. The AC 50 Hz is rectified by bridge rectifier BR1and the DC derived from the rectifier is again converted to AC by an inverter, which is formed out of MOSFET, by switching the MOSFET at 26 KHz by using 555 timer which is fed to a coil acting as the primary of an air core transformer, the secondary of which is fed to a second rectifier to drive a DC load. The air core transformer operating at 26 KHz is the main concept for wireless power transfer as one cannot transfer 50 Hz AC power by air core.

A. Working

The secondary coil develops a voltage of 26 KHz at 12volt while it is kept over the primary coil where air is used as the core. The output of the secondary is given to a high frequency bridge rectifier that delivers DC which is then regulated to maintain a constant charging current to a NiCd (Nickel Cadmium) rechargeable battery. However, the overall efficiency of the power transfer is less than 50% for all weakly coupled series resonators. Resonators with a Q of 1,000 should be able to send power over a distance 9 times the radius of the devices with an efficiency of 10%. Normally these batteries have a long life of 7 years. Thus the patient's operation time can be deferred to each 7 year after for replacement of the battery as the charging can be done for 7 years externally. But in the project a DC fan motor is provided in place of a battery charging arrangement for better visibility.

The power supply consists of a step down transformer 230/12V, which steps down the voltage to 12V AC. This is converted to DC using a Bridge rectifier. The ripples are removed using a capacitive filter and it is then regulated to +5V using a voltage regulator 7805 which is required for the operation of the 555 timer and other components.

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VI. CIRCUIT DIAGRAM

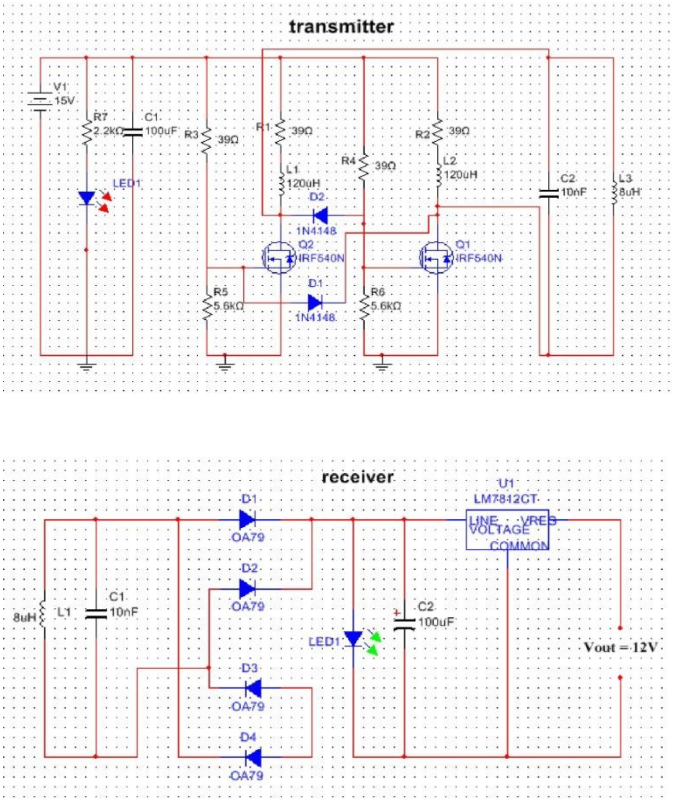

Figure 3. Circuit showing transmitter and receiver

VII. PROJECT LAYOUT

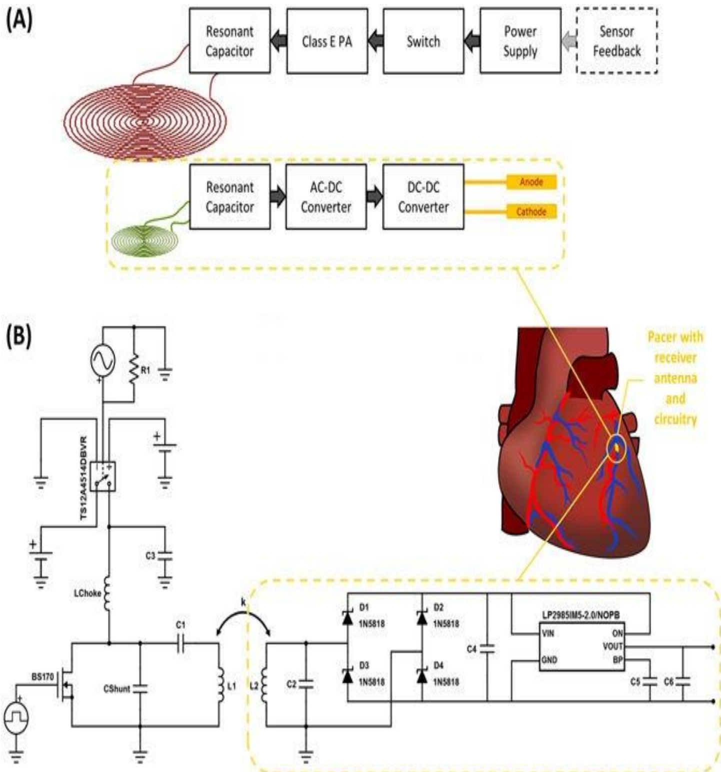

Figure 4. Layout of our Project

VIII. ADVANTAGES

We don't have to sit at one same place with wires connected with the devices for charging electric device like mobile, laptop, camera etc. Complete removal of wires is possible by this project device due to which our charging system becomes very user friendly and complexity can be reduced. At public places like Malls and stations, complexity of power system can be abridged by this device.

IX. LIMITATIONS:

The biggest problem is that its efficiency to transfer power decreases significantly with distance. It cannot transfer power to large distance of even few couple of meters from the device. Power transfer is not constant from sending and receiving terminals of the devices.

X. FEATURES:

1. Highly sensitive
2. Very accurate
3. Economical
4. Less Maintenance
5. Reliable

XI. CONCLUSION

The sole purpose of this project was to make a wireless device that could help to charge other electronic low power devices which are used on daily basis. Our main concern is charge the pacemakers which are used by the heart valve operated patients. In our project, we will be using resonant inductive coupling between coils to transmit powers. After analyzing and going through various possibilities of changes that could be bought in the project we are also working to make it more smart and intelligent. Our results showed that significant improvements in terms of power-transfer efficiency can be achieved. Though the power transmitting efficiency is not appreciable but our problem of mainly solving the charging of pacemakers is greatly achieved. Our device can have wide application of charging different daily using devices too by bringing small changes in the input terminals of other devices.

XII. REFERENCES

[1] Dr. Morris Kesler (2013) Highly Resonant Wireless Power Transfer: Safe, Efficient, and over Distance [Online] Available: http://www.witricity.com/assets/highly-resonant-power-transfer- kesler-witricity-2013.pdf

[2] Daniel Teninty, P.E (2010, November 2) Wireless Power Consortium [Online] Available:http://www.energy.ca.gov/appliances/battery_chargers/documents/2010-10-

[3] S. Kim, J. S. Ho, and A. S. Y. Poon, "Wireless Power Transfer to Miniature Implants:Transmitter Optimization," IEEE Transactions on Antennas and Propagation, vol. 60, no. 10,pp. 4838–4845, 2012

[4] H. Jiang, J. Zhang, D. Lan, K. K. Chao, S. Liou, H. Shahnasser, R. Fechter, S. Hirose, M.Harrison, and S. Roy, "A Low-Frequency Versatile Wireless Power Transfer Technology for Biomedical Implants," IEEE Transactions on Biomedical Circuits and Systems, vol. 7, no. 4, pp.526–535, 2013.

[5] A. S. Y. Poon, S. O'Driscoll, and T. H. Meng, "Optimal Frequency for Wireless Power Transmission Into Dispersive Tissue," IEEE Transactions on Antennas and Propagation, vol. 58, no. 5, pp. 1739–1750, 2010.

[6] R.-F. Xue, K.-W. Cheng, and M. Je, "High-Efficiency Wireless Power Transfer for Biomedical Implants by Optimal Resonant Load Transformation," IEEE Transactions on Circuits and

[7] Systems I: Regular Papers, vol. 60, no. 4, pp. 867–874, Apr. 2013.

[8] U.A. Bakshi and A.P.Godse, Electronic Devices And Circuits I, 3rd Ed. Pune, India:Technical Pub., 2008.

[9] A. F. J. Levi, Applied Quantum Mechanics, 2nd Ed. Cambridge, England: Cambridge Univ.Press, 2006.

[10] Luciano Mescia et al, Innovative Materials and Systems for Energy Harvesting Applications,Hershey PA: IGI Global, 2015.

[11] https://en.wikipedia.org/wiki/Wireless_power

[12] http://www.engineersgarage.com/articles/wireless-power-transmission