Wireless Power Transfer of Renewable Energy

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Abstract: **We cannot imagine the world without electric power. Generally the power is transmitted through wires. This project describes an original idea to avoid the harmful usage of electrical wires which involve tedious process of organizing them. Imagine a future in which wireless power transfer is feasible: cell phones, household robots, mp3 players, laptop computers and other portable electronics capable of charging wirelessly, instead of using bulky batteries. This paper describes about the utilization of solar energy and the wireless transmission of the generated power. The solar power is first stored in a battery then transferred through wireless medium by inductive coupling. There is a high thrust for renewable energy to mitigate the effect of global warming. The inductive power transfer has wide applications along with renewable energy. To demonstrate this solar based wireless power transfer system for home appliances has been developed. The advantage of this project is to increase the usage of renewable energy resources in order to reduce the CO emissions. And also the wireless power transfer system is a new way to transfer the power to the load rather than the conventional method of transferring power through livewires.**

Keywords*—inductive charging, non-radiative energy transfer, renewable energy sources, wireless power transfer system (WPTs)*

I. INTRODUCTION

Wireless power transmission is the transmission of electrical energy from a power source to an electrical load. Wireless power transmission (WPT) is an efficient way of transmitting electric power from one point to another through vacuum or atmosphere wirelessly.

This project describes about wireless power transfer system using inductive coupling. With the abundant solar energy in our country, it is essential to extract the maximum solar power at higher efficiency, since the construction of the solar panel is very expensive. The idea of wireless power transfer can be look back to 1820 when Andre-Marie Ampere invented his principle which states that an electric current produces a magnetic field.

Nikola Tesla experimentally demonstrated wireless power transfer in 189l. Tesla was conducted an experiment and he developed a model for resonant circuit that is able to couple a high frequency current into another resonant circuit of a similar type. With his circuit, he was able to transmit power wirelessly i.e. without any physical interconnecting conductor to power a light bulb. Hence the wireless power transfer system is necessary to move on to a new technological world.

This will reduce the complexity of the power transmission. And also protection is improved in this wireless power transmission system. We are in the energy deficit era because of huge demand from the consumers. This increases alternative source of energy to utilize more power. In India from the Sun we can extract more energy. Solar energy is the right alternative energy source to utilize. To decrease the usage of non-renewable energy source we can go for solar energy.

II. BLOCK DIAGRAM

Microcontroller 89s52 acts as a main control unit for the proposed system. It controls all operations sequentially according to the designed software algorithm. Keypad and LCD acts as a user interface to communicate with the system. Keypad used is a 4x3 Matrix keypad for entering the numbers. LCD 16x2 displays alphanumeric characters.EM – 18 based RFID reader is used to complete the payment process. Wireless passive RFID tags are used as a prepaid billing card.The power from the solar panels is stored in the lead acid battery, which can be further used to transmit power wirelessly. The transmission of the power is based on the Tesla coils concept. The relay switch plays an important role in controlling power through the Primary coil. The receiving coils receive the power which is the regulated and filtered to provide 5v dc.

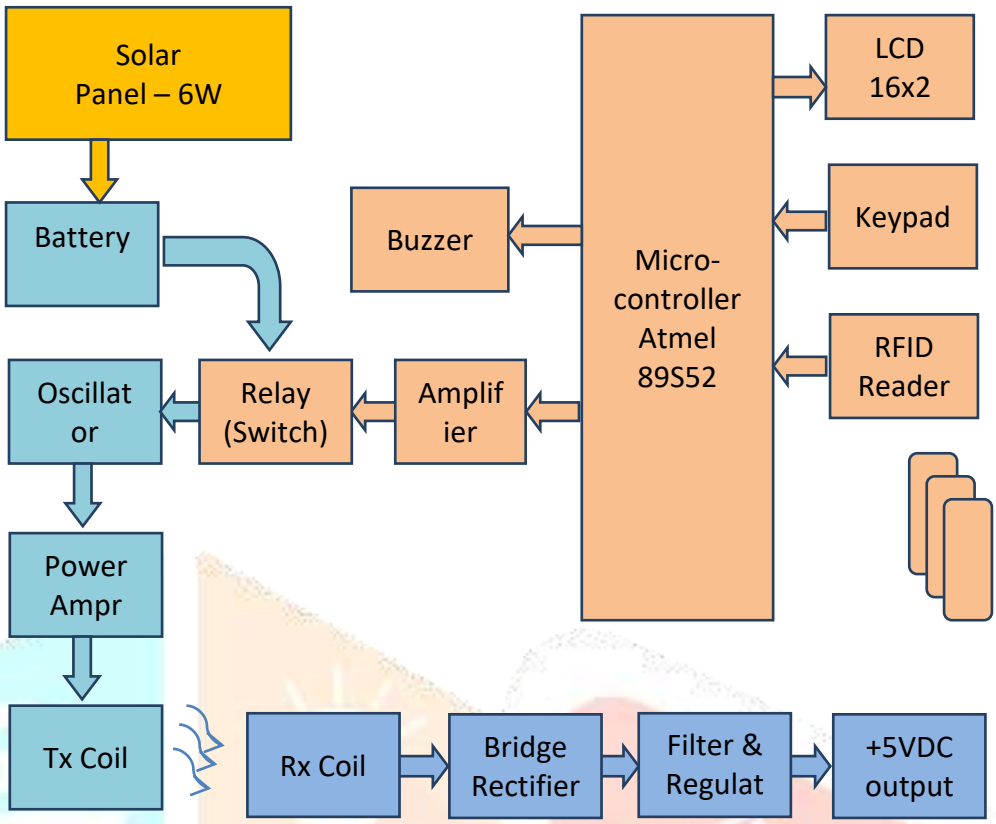

Fig 1

Atmel 89s52 also interfaces with the keypad for typing the charging duration and a secured pin for the payment.LCD is used for display of duration of charging and for the other purposes. Buzzer is provided to give a beep sound after the charging is completed. So the user can disconnect his device.

III. WORKING

The circuit mentioned in perspective consists of transmitter and receiver devices. Since inductive coupling is being used, Tesla coils are placed at both transmitter and receiver end. The number of coils and its prescription depends on the load used in the circuit. Typically to charge an LED bank, coils worth 24mH are used.

The input used is a solar panel. Renewable energy charged devices are a thing of the new present and hence wireless technologies must make full use of it. The solar panel gets charged completely during daylight and can be stored in the rechargeable batteries used in the circuit. This AC voltage can thus be used for transmission. The voltage gets stored in the batteries in the form of DC and hence needs to get converted to AC for transmission through the coils. Eventually, this transferred voltage gets through to the booster circuit and regulator for charging the load, here LED bank.

The main issue addressed here is to provide a sustainable and a long-lasting solution to the problem of usage of the nonrenewable sources of energy as well as wired communication. The solar energy which is a renewable form of energy and is available in abundance can be put to maximum use provided the techniques for harnessing it are appropriate and environment-friendly. One of the major constraints for implementing both the technologies together hand-in-hand is efficiency. Overcoming these shortcomings, this concept can be applied in various applications.

OBJECTIVE:

The interaction of transmitter and receiver takes place through the coil and the inductive coupling with them. Electricity is transferred in the form of current through the coils and is received in the AC form.

Two devices are said to be mutually inductively coupled or magnetically coupled when they are configured such that change in current in the wire at transmitter side induces a voltage across the ends of the other

wire at receiver side by electromagnetic induction. This is due to the mutual inductance and this principle is known as inductive coupling. A well-known example of inductive coupling is a transformer. Inductive coupling is preferred because of its comfortable, less use of wires and shock proof.

Inductive coupling uses magnetic fields that are a natural part of current's movement through wire. Any time electrical current moves through a wire, it creates a circular magnetic field around the wire. Winding the wire to a coil amplifies the magnetic field. The more loops the coil makes, the bigger the field will be.

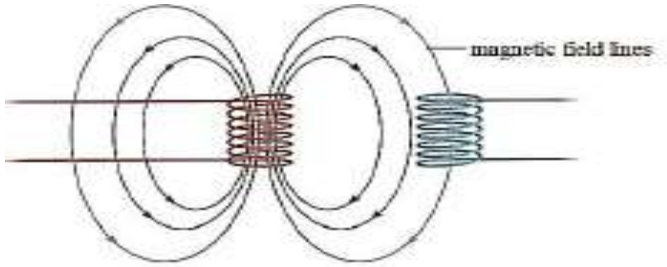

Figure 2. Inductive coupling

IV. ADVANTAGES

Renewable energy(SOLAR)

Wireless transfer independent of standard connectors.

Isolation from electrical shock.

It has less consumption of electricity.

Rust free and waterproof

Convenience

V. FUTURE SCOPE

IHS Market analyst David Green:

In 2016, just under 240 million devices with wireless charging capabilities shipped worldwide, he says. "But growth can be massive," "By 2025, you'll be talking over 2 billion devices a year will ship with wireless charging."

The circuit was just a trivial representation of a wireless charger concept. The time and bulk effort needed to take the project to perfection was not manageable.

To transmit the power to a greater distance, a high power radio frequency amplifier connected with an oscillator is needed. But the construction of the bulky RF power amplifier requires much time and patience.

High power vacuum tube transistor amplifier with high current will make the system more efficient.

A crystal oscillator circuit might be a better option for the transmitter circuit since it can produce a very high frequency A.C. current.

Use of resonant inductive coupling instead of inductive coupling will increase the efficiency, power transfer and range to a new level.

Further effort on this same project can yield some real solutions that can solve the problems of this project. The knowledge of this project will help those who want to design a wireless charging system.

VI. RESULTS

Fig 4

Payment is done. The charging starts and the time countdown starts in seconds.

The receiving coil is placed near the mobile to be charged.

The LED in the receiving circuit glows once the current is successfully transferred wirelessly via transmitter coil.

We can see the mobile receiving the current which shows it is charging.

VII. CONCLUSION

The goal of this project was to design and implement a wireless charger for low power devices via inductive coupling. After analysing the whole system step by step for optimization, a system was designed and implemented. Experimental results showed that significant improvements in terms of power-transfer efficiency have been achieved. Measured results are in good agreement with the theoretical models.

It was described and demonstrated that inductive coupling can be used to deliver power wirelessly from a source coil to a load coil and charge a low power device. This mechanism is a potentially robust means for charging low power devices wirelessly.

As it was mentioned earlier, wireless charging could be the next big thing.

VIII. REFERENCES

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