



WIRELESS GADGET CHARGING THROUGH MICROWAVES

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ABSTRACT

*With escalating and diverse development in mobile and gadget technology, there still stands an excruciating challenge for the contemporary world when dealing with Mobile and gadget charging. Present day gadgets are typically battery powered and their limited battery backup has become a major problem for every individual ranging from a common man up to a working professional and when we talk about modern day's smart gadgets, then smart phones are an inevitable part of it. This paper outlines an innovative technology and idea for charging our personal gadgets, wirelessly through a wireless gadget charging technique powered by wireless power transfer through microwaves and to diminish the dependence of the human race on **"WIRED CHARGERS"**.*

The paper basically involves wireless transfer of microwave energy or power through the air as the medium from the transmitting side and receiving that transmitted microwave power at the receiving side and further converting the received power into DC power which is required to charge our gadgets.

Keywords- Battery power, Microwaves, Smart gadgets, Wireless power transfer

I. INTRODUCTION

The main purpose of this concept is to minimize the dependence of human race on wired chargers. It aims towards an era of wireless technology where the charging of our gadgets will occur automatically in a given particular range.

The major contribution of this paper is to throw some light on the wireless charging technology through wireless power transfer that has the capability of revolutionizing current existing gadget charging technology and may have a powerful impact on the market.

The transmission of energy from one place to another without using wires is called wireless power transfer. It can be made possible using various techniques one of which is wireless power transfer through microwaves. Transmission of power wirelessly through microwaves comes under category of Far field techniques, it can be used to transfer high power from one place to another.

Some of the advantages of wireless power transfer includes good efficiency, low maintenance cost and wireless power can reach to the place which are remote.



II. BASIC FUNCTIONING OF BLOCK DIAGRAM

2.1 Transmitting side

Power transmission is the movement of energy from its place of generation to a location where it is applied to perform a desired work.[1]

Transmitting side components:-

2.1.1 Microwave generating source –

Microwaves are a form of electromagnetic radiation with wavelengths ranging from one millimeter to one meter; with frequencies between 300 MHz and 300 GHz. To generate microwaves we have used magnetron as the source. [2]

2.1.2 Transmitting antenna-

The transmitting antenna plays a vital role in transmitting the generated microwave power to the receiving side through the air medium. As we are using microwaves as the energy carrier, we have following antennas available that can be used in the microwave frequency range namely:[3]

2.1.3 Slot antennas.

2.1.4 Horn antennas

2.1.5 Micro strip patch antennas

From the following antennas we will be using slot antennas at the transmitting side which will be fabricated according to required parameters like bore sight direction and required radiation pattern.

2.2 Slot Antenna

It consists of a metal surface, usually a flat plate, with one or more holes with a slot cut out as shown in figure 3. When the plate is driven on an antenna by a driving frequency, the slot radiates EM Waves.[4]

Functioning of transmitting side

- Magnetron basically consists of cathode, anode and pair of magnets
- Anode consists of cavities which act as tuned circuits.
- When power is applied to cathode, electrons boil out from the cathode and rush towards the anode.
- By the presence of magnets, a magnetic field exists inside the magnetron. Due to this magnetic field, electrons do not rush in straight paths towards the anode. They follow a curved path towards the anode & rotate spirally with high speed in cavities or tuned circuits, thus resulting in producing microwaves.
- These microwaves generated through the magnetron are transmitted out of the magnetron through a piece of waveguide.
- Now, the generated microwaves will be transferred to an omnidirectional antenna (slot antenna) fabricated according to the requirements, which will emit the microwave power in all directions.

III. RECEIVING SIDE

Receiving side basically involves a micro strip patch antenna that works in the microwave frequency range of 2.45 GHz and is able to receive the power coming in the form of microwaves from the transmitting side.

Following the output of the receiving antenna there will be a rectifier that will convert the AC voltage into the usable DC voltage and then this DC voltage will be regulated according to the power required by the gadgets. This receiving side must be embedded in the gadget which we want to charge wirelessly. [3]

Receiving side components:-

3.1 Micro Strip Patch Antenna-

A microstrip patch antenna usually means an antenna which is fabricated using microstrip techniques. These antenna mainly works on microwave frequencies and consist of multiple patches in two-dimensional array. Antenna is usually connected to the receiver side through foil micro strip transmission lines as shown in figure 2. [5]

3.2 Voltage Regulator

It is basically designed to maintain a constant required voltage level at output of the Receiving side. It may be used to regulate one or more AC or DC voltages. [5]

3.3 Rectifier

It's an electrical device that converts AC (Alternating Current) to DC (Direct Current) and this phenomena is known as rectification.[2]The regulated DC output of the receiving side is driven to the device battery through which it gets charged.

Figures

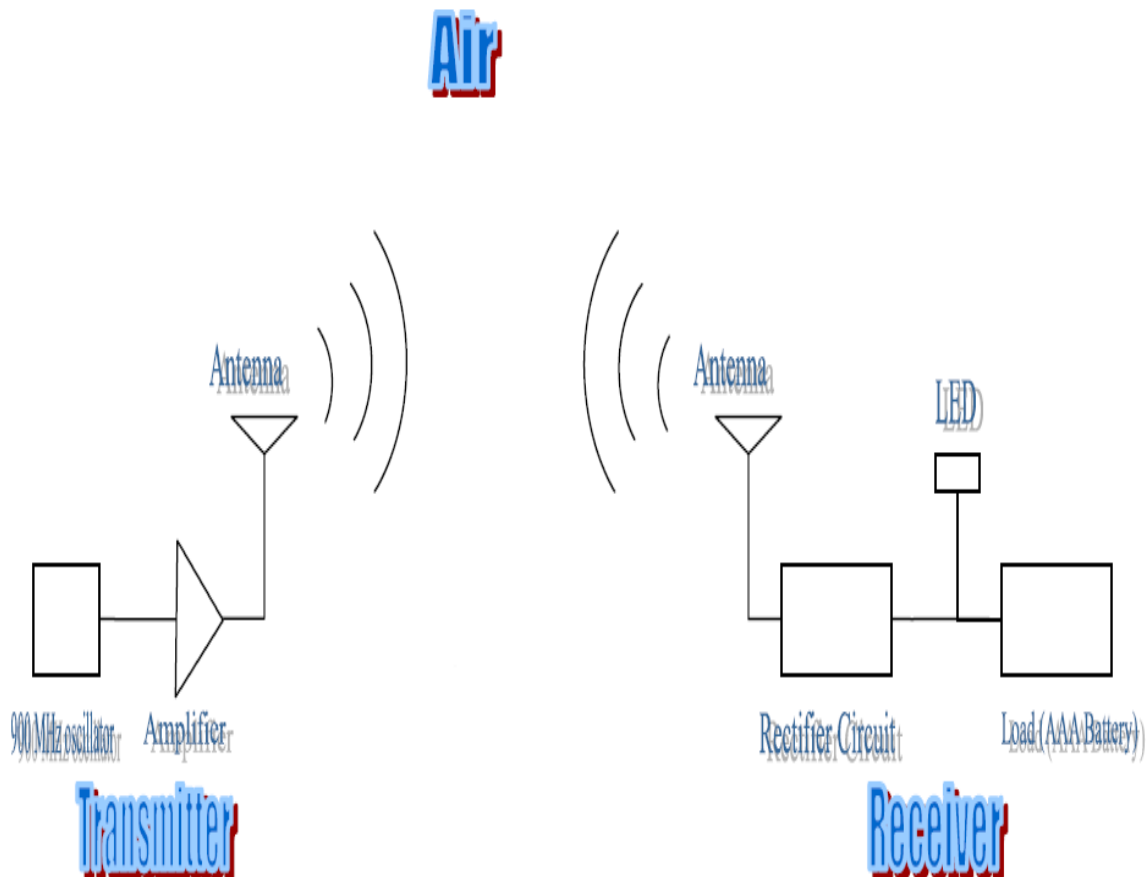


Figure1: Functional Block Diagram[1]

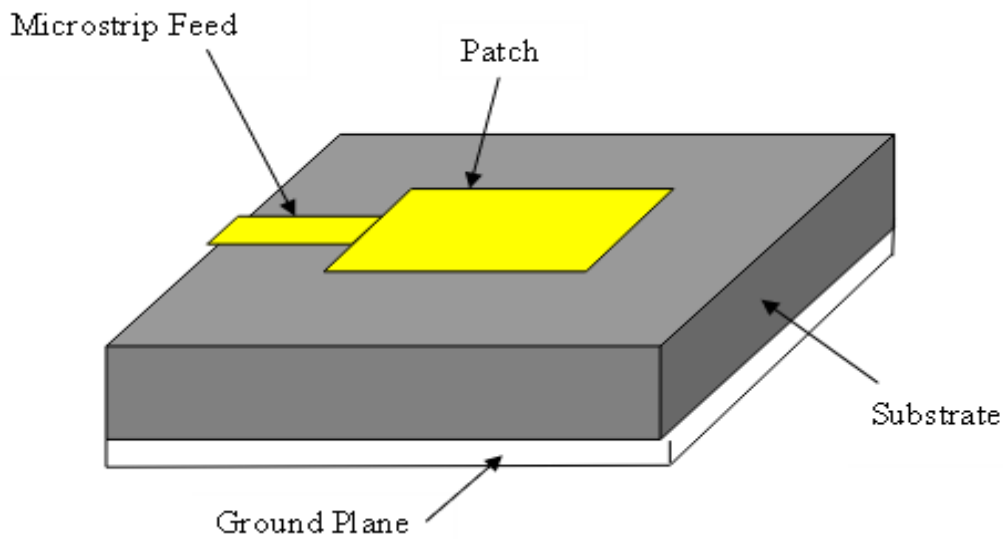


Figure 2: Microstrip patch antenna[5]

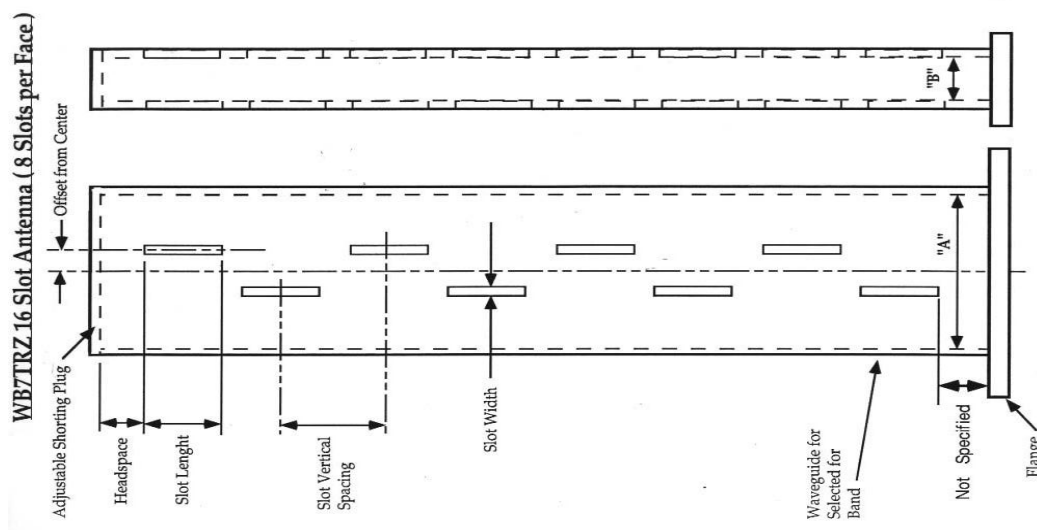


Figure 3: Slotted Antenna[4]

IV. CONCLUSION

Thus in this paper we have generated an innovative technique of wireless gadget charging through which we can charge our personal gadgets by receiving the power transmitted through air as a medium. The efficiency of this model can be increased by using precisely fabricated transmitting and receiving antennas. On being fair to the term “Wireless charging” in this paper, some of the salient features of our proposed model “Wireless gadget charging through microwaves” includes automatic start of charging of a device in which our receiving module is embedded when it comes in the range of our transmitting antenna. Secondly, it can charge a gadget wirelessly that is in the range of the transmitting side and there is no need to place our phone on any type of charging pad, just be the gadget in the range of the transmitting antenna.



Some of its limitations include infeasibility in case of power consumption on small scale usage but when we analyze it on a large scale then this issue can easily be resolved and secondly, efficiency of a magnetron is 75% approx.

Future applications of this paper involves easy installation in the rooms or in professional meeting chambers where the gadget or smart phone of a person sitting in that chamber can automatically get charged by receiving the microwave power coming from the transmitting side placed at the ceiling of the chamber just like as “Ubiquitous charging network”. Secondly, on larger scale it can be realized as a network of microwave power generating sources(transmitting side) placed at certain distance providing power to every gadget coming in the range of these transmitting sides and thus this model can be converted into “Wireless Multi Gadget Charging through Microwaves”.

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