



WIRELESS CHARGING OF HYBRID ELECTRIC MOPED USING MICROWAVES

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ABSTRACT.

In today's fast moving technology as there is scarcity of fuel, Hybrid Electric moped powered by battery as well as petrol. This vehicle is made dynamic in nature by making use of electrical power from battery and fuel power. Charging the battery for a while has generated a lot of problems for its users especially in areas where there is no access to adequate and stable power supply. Charging of battery is a major problem in today's Hybrid Electric moped.

Though the world is leading with the developments in technology, but this technology is still experiencing some deficiencies because of certain limitations. Today's world requires the complete technology and for this purpose, we are proposing 'Wireless Charging Using of Hybrid Electric moped Microwaves.

This wireless charging technology is expected to eliminate all the problems and difficulties associated with the present day's battery charging. The advantage of this technology is that it can wirelessly charge up the battery by saving time, electricity and money in a long run for the general public.

It is a prototype device that converts microwave signals to DC power for easy charging of Hybrid Electric moped.

KEYWORD: *Microwave power transmission, wireless power transfer, electromagnetic spectrum, rectinna, sensor circuit, hybrid electric moped*

1.0 INTRODUCTION:

The automotive industry occupies an important place in most countries given its place in the lifecycle of communities. In the most cases, vehicles are harmful to the environment since they consume large amounts of fossil fuels and the sector still has a long way ahead of itself to mature; also, at bare minimum, reduce GHG. Nowadays worries regarding climate change and its energy supply safety, are undoubtedly paving the way in transportation to utilize renewable energy systems (RESs) as opposed to conventional forms of energy. Additionally, newer EV innovations are prepared and developed to execute environmental permanence. For sustainable and clean mobility, EVs are the right useful option and are becoming increasingly assimilated in many cities, all around the world. The energy consumption is related to general electric equipment and the usage of electric era of hybrid electric moped and technology. Technological advancements has taken giant strides to make the life of a common man simpler and efficient. But battery has been a major problem faced by human in day to day usage of the hybrid electric moped.

WIRELESS power transfer transfer (WPT) refers to a family of techniques for delivering power without wires or contacts using Microvaves.



Wireless Power Transfer (WPT) simply means the sending of electrical power from a power source to a consuming device without the need for a solid wires or conductors. Simply put, the targeted device will receive the electrical power without any physical contact, but with the help of electromagnetic waves such as microwaves. Nikola Tesla, in late 1800's coined and introduced us to the world of wireless transmission which was later researched upon by William.C.Brown who pioneered the technology to transmit power using microwaves giving rise to the term Microwave Power Transmission (MPT)

Although introduced in 1964, this technology remains an area of interest for researchers and engineers all over the world, even to this day. Successful implementations of MPT has been done over the world in Japan; MIT where a research team led by Professor Marin Soljagic successfully transmitted power to a 60W light bulb at 40% efficiency over a distance of 2m (7 feet). With this paper, our aim is to provide certain future techniques which can be efficiently applied to world of smart phones and technology to avoid the mess of using wires and chargers as a whole to make the life of a common human being easy.

Microwaves are radio waves (a form of electromagnetic radiation) with wavelengths ranging from as long as one meter to as short as one millimeter. The prefix "micro-" in "microwave" is not meant to suggest a wavelength in the micrometer range. It indicates that microwaves are "small" compared to waves used in typical radio broadcasting, in that they have shorter wavelengths.

Microwave technology is extensively used for point-to-point telecommunications (i.e., non-broadcast uses).

Microwaves are especially suitable for this use since they are more easily focused into narrow beams than radio waves, allowing frequency re use; their comparatively higher frequencies allow broad bandwidth and high data transmission rates, and antenna sizes are smaller than at lower frequencies because antenna size is inversely proportional to transmitted frequency .

The technology and theory behind wireless charging exist around for a long time the idea was conceived by Nikola Tesla, who demonstrated the principle of wireless charging at the turn of century. Nikola Tesla is the one who first proposed the idea of Wireless Power Transmission and demonstrated the transmission of ELECTRICAL ENERGY WITHOUT WIRES in 1891. In 1893, he invented the illumination of vacuum bulbs without using wires for power transmission at the World Columbian Exposition in Chicago. The Wardenclyffe tower was designed and constructed by Tesla mainly for wireless transmission of electrical power.

With hybrid electric moped, the recharging of hybrid electric moped batteries has always been a problem.

The main objective of this current proposal is to make the recharging of the hybrid electric moped independent of their manufacturer and battery make. In this paper a new proposal has been made so as to make sure the recharging of the hybrid electric moped is done by use of microwaves. The microwave signal is transmitted from the transmitter along with the message signal using special kind of antennas called slotted wave guide antenna at a frequency is 2.45 GHz. To enable this project work successfully as intended there is need to add a sensor, rectenna circuit in our mobile phone. This is one of the best technologies and for this purpose, we are proposing wireless charging of mobile phones using microwave.

Wireless power transmission:

Nikolas Tesla first transmitted electricity without wire and known as the father of wireless electricity transmission. Wireless power transmission works on the principle of Magnetic induction. As we put one coil



carrying current through it, it creates a magnetic field near to it. And if we put other coil over there than it is induce by the first coil and it carry current from it. This is the principle of magnetic induction. In the transmission side, the microwave power source generates microwave power and the output power is controlled by electronic control circuits. In the receiving side, an antenna receives the transmitted power and converts the microwave power into DC power.

Components of Wireless Power Transmission System:

There three important components of this system which are Microwave generator, Transmitting antenna, and the receiving antenna.

1. Microwave Generator

The Microwave Generator is the one which generates the microwave of preferred frequency. It generates the Microwave by the interaction of steam of elections and the magnetic field.

2. Transmitting Antenna

Transmitting antennas are use to transfer the signal from free space to the device. There are many kind of slotted wave guide antenna available. Like parabolic dish antenna, micro strip patch antennas are the popular type of transmitting antenna.

3. Rectenna

Its elements are usually arranged in rectenna. The current induced by the microwaves in the rectenna is rectified by the diode which powers a load connected across the diode. Scotty diodes are used because they have low voltage drop and high speed so that they have low power loss. rectennas are highly efficient at converting microwave energy above 90% has been observed with regularity. The basic addition to the mobile phone is going to be the rectenna. A rectenna is a rectifying antenna, a special type of antenna that is used to directly convert microwave energy into DC electricity. Its elements are usually arranged in a mesh pattern, giving it a distinct appearance from most antennae. A simple rectenna can be constructed from a Schottky diode placed between antenna dipoles. The diode rectifies the current induced in the antenna by the microwaves .

WORKING:

A wireless charger sends an AC power signal to the transmitting coil. When the current is transferred through the coil an electromagnetic field is created around the coils, which when in range of another induction coil, the oscillating magnetic field creates a current in the receiving coil. Power can be transferred safely through objects which exist between the magnetic field creating coils. The addition of extra coils extends the range at which the power can be inductively transferred. Wired circuitry on the receiver converts the AC power signal into DC voltage which can then be used to charge electronic devices through batteries. It is this exact method used for charging battery of hybrid electric moped .

DESIGN:

The system designing of wireless charging of hybrid electric moped using microwaves mainly consist of four parts as transmitter design, receiver design, the Process of Rectification, sensor Circuitry .



1. Transmitter design:

A magnetron is a diode vacuum tube. Filament in the tube act as the cathode. Magnetron actually act as a oscillator to produce microwaves. It can be done by putting magnet between the resonating chambers which is the center of the oscillator. These resonating chambers are called the anode of the magnetron. When electrons come out from the cathode it direct towards the Anode. As it pass through the magnetic field it start circulating in the resonating cavity and start producing waves according to its frequency. And the generated RF signal flow outside of the chamber .

The microwaves are then directed towards the mobile device waiting for its reception so as to be converted back to the electrical power through rectenna. In the case of a magnetron used for radar and communication, the wave guide will connect to an antenna that transmits the waves. This is achieved by a metal structure known as a waveguide, along which the waves travel; normally a slotted wave guide antenna is used. It normally extends outside the main body from one of the cavities, capturing the microwaves and guiding them along its length .

Cross field and magnetic field are used to produce high-power output. The slotted wave guide antenna is used to transmit the microwave generated at the transmitter side with the help of magnetron. This antenna has aperture efficiency up to 95 percent making it an almost ideal power transmitter. This particular antenna has a very high power handling capacity with 64 slots .

2 Receiver design:

We have to add a sensor and a Rectenna at the receiver side. As we have seen that rectenna actually convert the Microwave in to the DC power. Rectenna are very powerful to convert the Microwave in to the Electricity . A simple rectenna is constructed by using a schottky diode which is formed by fusing a metal with a semiconductor. The semiconductor material used for this purpose is selected from different materials like chromium, molybdenum, tungsten etc .

The schottky diode is used in this antenna receiver design because its recovery time is faster, it has a comparatively lower forward voltage drop and pretty good RF characteristics .

Actually the size of rectenna can be reduce using the Nano technology. Another important part is the Sensor.. So here sensor is used to detect whether the hybrid electric moped is using microwaves or not .

3. The Process of Rectification:

Microwave can travel through the media but it also lose some energy. So our key objective is to rectify the circuit. Our objective is to rectify the waves at the low cost. And also we have to make the detection more sensitive. To achieve this, we make use of a rectenna .

Rectenna is a combination of a rectifier and an antenna. The dc electrical power for charging the hybrid electric moped is transmitted from the tower in the form of microwaves.

At the receiver end, Rectenna which is fitted on the hybrid electric moped circuitry converts it back to the electrical power and the mobile gets charged .

Rectifying antenna rectifies the received microwave signal energy into the dc current. It comprises of a mesh of dipoles and diodes for rectifying purpose. A simple rectenna can be constructed by using a schottky diode which



is going to be placed in between the antenna dipoles. The diode rectifies the current induced in the antenna by the microwave energy .

4 SENSOR CIRCUITRY:

It is a simple sensing circuit using, which detects whether the message signal is received or not. A simple F to V converter such as LM2907 would greatly serve the purpose. It would simply act as a triggering switch for the rectenna. Thus on receiving the message signal the sensor circuit will trigger the rectenna to be switched ON and vice versa .

The sensor circuit is used to find Whether the hybrid electric moped is using the microwaves for message transferring or not. So when our battery is receiving microwave signal it makes the rectenna circuit on and charge the battery .

CONCLUSION:

In this modern era of Science and Technology, A novel use of the Rectenna and a sensor in a hybrid electric moped could provide a new dimension in the revolution of battery . Covering these aspects, this new system of wireless recharging will certainly bring innovative Change in recharging Electronic Equipment results in very easy use of hybrid moped . Thus this paper successfully demonstrates a novel method of using microwave's power to charge the hybrid electric moped.

Since, it is a wireless technique this technology can be implemented even in remote areas devoid of charging facilities. The limitations of MPT can be overcome with time and more research to increase the the distance of power transmission, its biological and global effects making its future prospects for charging battery within very short time.

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