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POWER SHOE: PIEZOELECTRIC WIRELESS POWER TRANSFER – A MOBILE CHARGING TECHNIQUE

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Abstract:

When a person walks, pressure is wielded on the ground and this pressure can be converted into electrical energy and it can be used to power electronic bias. In this paper a Mobile charging system is designed. A piezo electric creator is placedin the shoe. The power that's generated by piezo electric creator when a person walks is transferred tothe device by using amid-range wireless power transfer(WPT) which is a Resonance coupling fashion.

Keywords: Piezo electric creator, Wireless power transfer(WPT), Resonance, and Mobile charging.

INTRODUCTION

In the recent times there has been an adding interestin exploration and development of advanced smart phone technology. But as technology evolves so are the problems associated with it, and one amongthose is the fast draining of battery. nearly every smartphone stoner wishes he'd more battery life. Now, imagine your phone getting charged where ever you go. This is possible by Piezo electric wireless power transfer mobile charging fashion.The keys to this fashion are the piezoelectricity and Wireless power transfer(WTP).

Harvesting mechanical energy from mortal stir is an seductive approach for carrying clean and sustainable electric energy(1). Piezoelectricity is electrical energy produced from mechanical pressure(similar as walking, running). When pressure is applied to an object, a negative charge isproduced on the expanded side and a positive charge on the compressed side of the piezoelectric demitasse. Once the pressure is relieved, electrical current overflows across the material. Wireless power or wireless energy transmission is the transmission of electrical energy from a Power source(piezoelectric Power) to a cargo(similar as any electrical device) without any physical connector similar as cables or operators.Energy is gathered

II. DESIGN

The Design consists of two units. Generation- transmission unit and receiver- charging unit. The Generation

- Transmission unit side consists of the Piezo electric creator, capacitance bank, oscillator, and transmitterTX unit. This unit is integrated inside the shoe. Fig. 1 shows the design of the system.

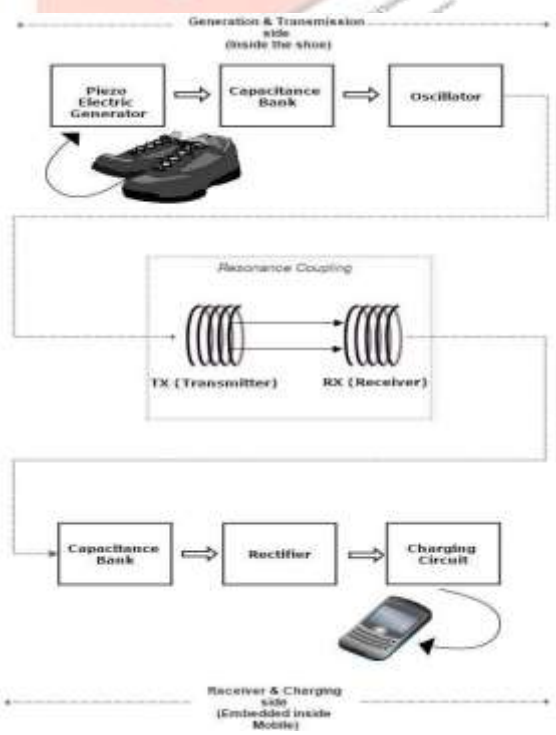

Fig:1. Block diagram of Fig.Piezo electric wireless power transfer mobile charging technique.

Receiver and charging unit consists of capacitance bank, rectification circuit and charging circuit. This can be either designed mobile independent or bedded inside the mobile. The receiver receives the power and this power is converted to DC force usinga rectification process and the affair is fed to abattery of a device(mobile) through the charging circuit.

A) PIEZO ELECTRIC GENERATOR DESIGN

The Piezo electric creator is placed inside a Shoe. A shoe has two points where the pressure wielded in outside and they're the heel and the toe, and this is the exact place where the piezo electric unit is placed. Fig. 2. Shows the arrangement of the piezoelectric creator inside a shoe.

Fig:2. Arrangement of piezoelectric creator inside a shoe.

The design consists of a brace of array of piezo electric creator units connected in series. The Font panel has the array of piezo electric creator in a direct arrangement and the hinder panel with aindirect arrangement. The receiving and chargingside collects intermittent or nonstop energy inputfrom the piezo creator and efficiently stores theirenergy in the capacitor bank. During the chargingprocess, the capacitor voltage is continuouslycovered. When it reaches5.2 V the module affair isenabled to supply power to a Rectifier and chargingunit(2).

B)WIRELESS POWER TRANSFER(WPT)

In the early 20th century, before the electrical- line grid, Nikola Tesla devoted important trouble towards transferring power wirelessly. still, typical images(e.g., Tesla coils) involved undesirably largeelectric fields. The once decade has witnessed a swell in the use of independent electronic bias. As a result of this development, interest in wireless powerhas reemerged(3). In recent times, there has been adding interest in exploration and development of wireless power technology to exclude the " last string " after Wi- Fi getting extensively accepted(4).

Wireless electricity fashion used then's grounded on strong coupling between electromagnetic reverberative coils to transfer energy wirelessly between them.(5) This differs from other styles like simple induction, broilers, or air ionization. The system consists of transmitters and receivers that contain glamorous circle antennas critically tuned tothe same frequency.

The principle of deciduous Wave Coupling extends the principle of Electromagnetic induction(6). Electromagnetic induction works on the principle ofa primary coil generating a predominant glamorous field and a secondary coil being within that field so a current is convinced within its coils. This causes afairly shorter range due to the quantum of power needed to produce an electromagnetic field. Over lesser distances thenon-resonant induction system ishamstrung and wastes much of the transmitted energy just to increase range. This is where theresonance comes by and helps the effectiveness dramatically by" tunneling" the glamorous field to a receiver coil that resonates at the same frequency.

Theoretical analysis shows that by transferring electromagnetic swells around in a largely angular waveguide, deciduous swells are produced which carry noenergy.However, the deciduous swells can allow the energy to lair to the power drawing waveguide, where they can be remedied into DC power, If a proper reverberative waveguide is brought near the transmitter. Since the electromagnetic swells would lair, they would not propagate through the air to be absorbed or be dissipated, and would not disrupt electronic bias or beget physical injury.

III. SYSTEM DESIGN & CIRCUIT.

The schematic design of Generator and transmissionside of the Piezo electric wireless power transfer mobile charging fashion is given in Fig 3.

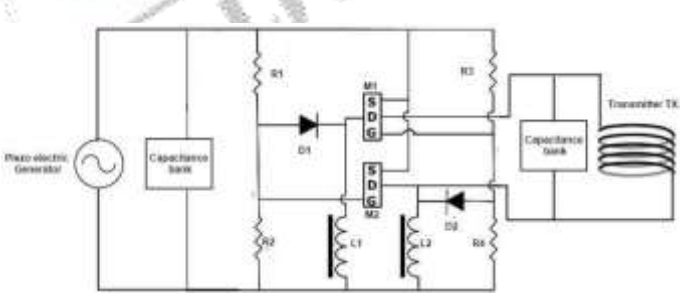

Fig:3 Generation and transmission circuit

It can be noted from the circuit that the piezo electric creator is the source which powers the whole circuitand the power is transmitted wirelessly using wireless power transfer fashion.

The schematic design and circuit of the receiver and charging side is shown in Fig 4. It can be seen that the receiver RX and the capacitance bank are connected in resemblant and a rectification circuit isalso connected. This circuit converts the force into DC form, and the charging circuit is powered whichin turn charges the battery in the device. A controllercan also be connected between the therapy and charging circuit if necessary.

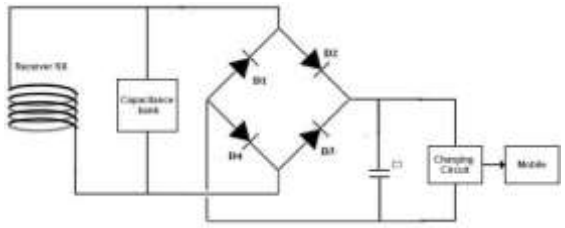

Fig 4. Receiver and charging circuit

IV. PROTOTYPE

V) PROTOTYPE CIRCUIT DESIGN

The prototype circuit design is shown in the Fig 5. The circuit consists of Piezo creator which is the source for the system. This energy which isgenerated is remedied and controller and is transferred to a high frequency flipping circuit, this power is also transferred using wireless power transfer fashion. also the entered power is remedied,regulated and boosted and transferred to the charging module.

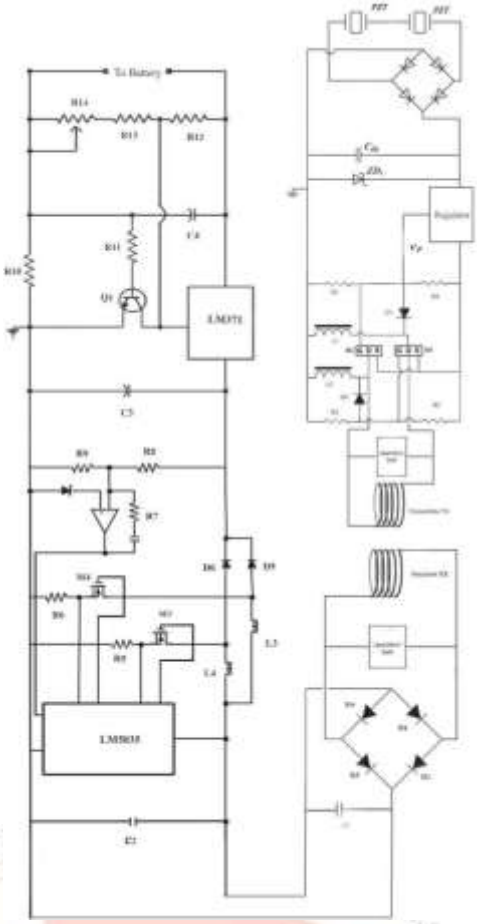

Fig 5. Prototype circuit design

The LM5035 which is PWM Controller with Integrated Half-Bridge is used then, but latterly inthe final design as shown in the simulationcircuit(Fig. 6.) the interleaved boost is used.

VI. SIMULATION

Fig 6. illustrates the circuit of the prototype. The ACSource in the simulation represents the piezo electriccreator which harnesses the energy from the mortal stir.
A simulation is a model that mimics the operation ofan existing or proposed system, providing evidencefor decision-making by being able to test different scenarios or process changes. This can be coupled with virtual reality technologies for a more immersive experience

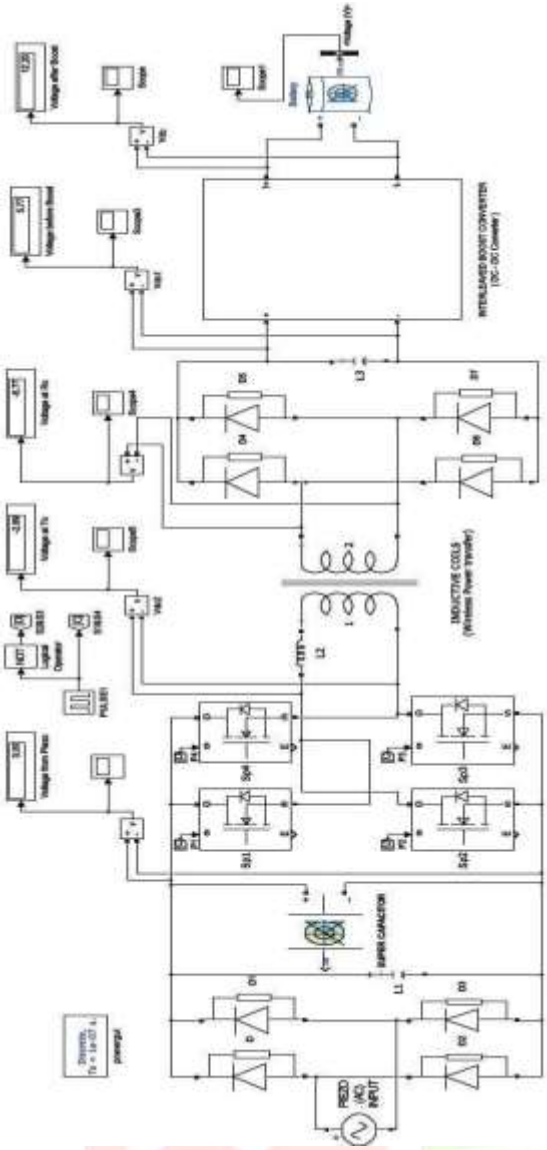

Fig:6. Simulation Circuit(Matlab- Simulink)

The AC power which is generated from the piezo electric creator is also converted into DC using Rectification circuit which in our prototype is aground therapy. This power is farther filtered using filtering rudiments. This power is regulated using controller, also this power is converted into high frequency AC using high frequency inverter. Just before the power is transmitted using wireless powertransfer system it's discharged through a super capacitor.

The power transmitted using wireless power transfer, then reverberative Coupling fashion is usedto transmit the power efficiently. This power is the entered in the Rx(Receiver Coil) and the attained power is farther remedied using ground rectificationcircuit. Since the affair voltage entered from therectification circuit is inadequate low for chargingelectronic device. The power is boosted using DC- DC motor, interleaved boost motor as shown inFig. 7.

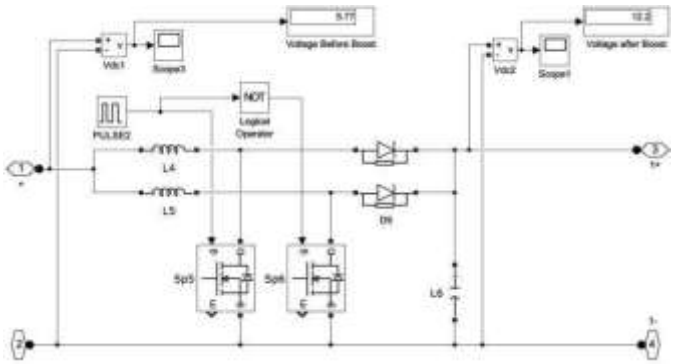

Fig:7. Interleaved Boost motor simulation

The proposed model is designed to input 6 Volts tothe boost motor and at the affair it can be
seen that the voltage is boosted to 12 Volts

VII. Affair & RESULTS

The labors waveforms of several units in thesimulation of the prototype is shown below.

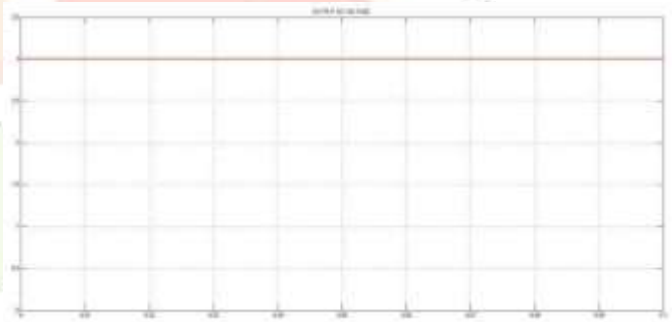

Fig 8. Affair from Piezo(After rectification)

Fig 8. is the graphical representation of the affair after rectification unit. The X axis represents the time in Seconds and the Y axis represents the voltage in volts. Fig 8. Illustrates the Affair voltage after thepower attained from piezo electric creator isremedied using a ground therapy. The voltage after rectification is 3 Volts DC. The constant affair attained from the controller is also converted to AC using a high frequency inverter. The affair from the high frequency inverter is shown isFig. 9. It's essential to input a high frequency AC to wireless

power transfer unit.Fig. 9. explains the input at the coil Tx of the wireless power transfer unit.

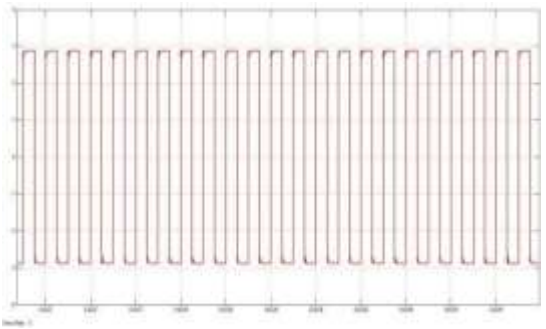

Fig:9. Input at Coil Tx(Wireless Power Transfer) after high frequency inverter.

Fig 9. is the graphical representation of affair at the high frequency inverter circuit which is also the input for the transmitter coil of the wireless power transfer system. The coils are magnetically coupled therefore the voltage is convinced in the Receiver Coil Rx is represented in Fig. 10.

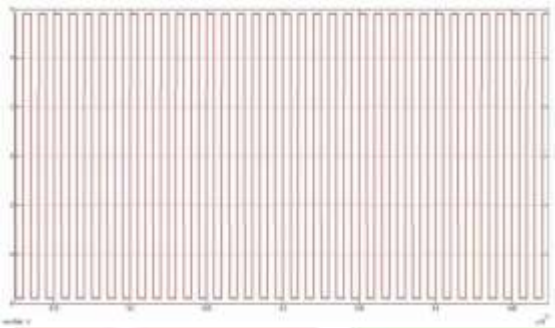

Fig:10. Affair at Coil Rx(Wireless Power Transfer)

10. shows the voltage at the receiver coil Rx. It can be seen fromFig. 9 that the voltage while transmitting is 3V, and the Voltage at entering end is6V, this is due to the number of turns in the coil theturn portion is 12. This power is also remedied and regulated from rectification circuit and regulation circuit. The voltage is boosted using a Dc- Dc Motor.

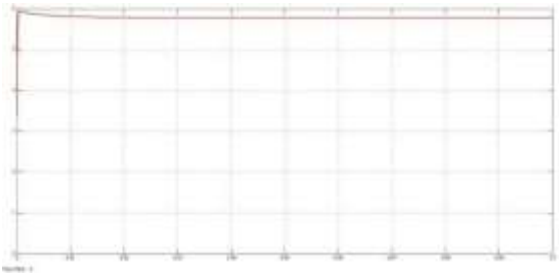

Fig 11. Voltage before Boost Converter.

Fig 11 shows the voltage after rectification. The AC force is remedied to DC using a rectification circuit, then a ground therapy.Fig. 11 is the graphical representation of the affair after rectification unit. The X axis represents the time in Seconds and the Yaxis represents the voltage in volts. The voltage afterrectification is

6 Volts DC This voltage is fed to the Dc- Dc boost motor, then the Dc- Dc Motor used is an InterleavedBoost motor. A introductory boost motor converts aDC voltage to a advanced DC voltage. Interleaving advertisements fresh benefits similar as reduced ripple currents in both the input and affair circuits.

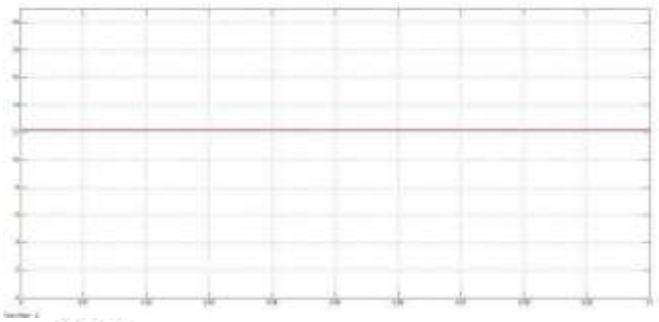

Fig 12. Final Affair

Fig 12 shows the affair voltage of DC- DC Motor – Interleaved boost motor. The boost Converted givesthe affair of 12V at the affair.Fig. 12 is the graphical representation of the affair after boosting. The X axis represents the time in Seconds and the Y axis represents the voltage in volts. This voltage is also further used to charge the battery. therefore the affair of the system is 12V DC, which is also regulated andsupplied to electronics bias.

VIII. CONCLUSION

In this design we've illustrated the design of system which can harness the power generated by the mortal movements and transfer the power to a device wirelessly. We believe that this exploration holds thekey to an continued way of using smart phones. This system can also be erected shoe independent and as a compact interpretation that can swatch on to any shoe.

This philanthropic design holds the result to theproblem nearly every smartphone used faces. Around1.8 Billion people use Smartphone, and nearly every smartphone stoner wishes he'd more battery and a way to charge it anytime. This

exploration design holds the key to an continued wayof using smart phones.

Harvesting energy from mortal movements is anseductive approach for carrying clean and sustainable energy. This design has its root in all theareas of consumer electronics. This design also extends unborn work includes designing authentication and monitoring systems for this design.

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