Research Proposal for Wireless Power Transfer Resonance Inductive Coupling Circuit using a Modified Amplitude Modulation Wave for Powering a Load or Charging a Battery

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Abstract: ***This essay will proposition a test to either prove or disprove the possibility of long distance wireless power transfer by incorporating a amplitude modulated wave modulated in a way to increase both the electrical field as well as the magnetic field of the wave to cause a increase in resonance in LC circuit that is coupled with either a primary coil to increase resonance thus amplitude even more or a secondary inductive coil beside the primary coil to not only increase amplitude in the circuit but to also increase voltage as well so as to increase the overall wattage of output of the circuit while at the same time overcome damping of the circuit due to resistance overall.***

Keywords: Wireless, power, transfer, resonant inductive coupling, LC circuit, primary coil, secondary coil

Purpose of study: The purpose of this research proposal is to determine if the new form of resonance inductive coupling circuit and companion waveform described in this essay can allow for wireless power transfer at greater distances than what is currently used. This essay has been written to describe such waveform and circuit so that it might be tested and developed for long distance wireless power transfer.

1. Introduction

The world has been trying to find suitable ways to power their electronic devices since the induction of electrical current but there has always been limitations. One of these limitations is that current can't be transferred everywhere because those devices need to be plugged into a stationary circuit or portable power source thus limiting the access to electric current. Scientist like Nikola Tesla envisioned and even tried to create a wireless energy transfer system and failed. That even to this day technology involving reliable energy transfer systems are limited to either a short range or to the amount of power they can put out for use. Many systems like Inductive coupling, resonance inductive coupling, capacitive coupling, magnetodynamic coupling, microwave, light transfer and energy harvesting have been used and developed to a certain extent but their capabilities are still either disabled by their range in which they can charge or their level of power they can transfer [1][2][3] In this research proposal I will suggest a new way or resonance inductive coupling that has a larger range by conventional resonance inductive coupling devices that also incorporates microwave technology as well. This concept doesn't only work on the development of a new circuit to handle and convert radio waves to usable power but also on the transmission of the radio wave that creates the resonance in a circuit. It uses Amplitude modulation (AM) with a distinctive continuous sine wave and sidebands (double) in this context coupled with a resonance circuit that keeps increasing the value of resonance [4] in the circuit with little or no damping effect. The first part of the explanation of this circuit and its coupling modulated wave is to understand the problem of damping in a circuit that causes lose of resonance so as to decrease the amount of power output instead of increase it and the reason why this is so. Outside of resistance in the circuit the type of wave that's transferred is not adjusted to maximize resonance so to correct this problem the sideband (or double side band) and the continuous carrier sine wave in a Amplitude modulation wave, one: has to find a way to exponentially increase current with each oscillation of the electrical or magnetic field or make a continuous current that is above the normal current for a system to run, Even if the device receiving the wave resonates the wave, because impedance will eventually overcome the resonance, cause resistance and slow or stop the system. The idea is that the frequency of the wave contributes to its electrical field where as its magnetic field is comparable to its magnetic field. Thus the wave itself has to be set up to increase at least the magnetic field in the receiver by increasing the magnetic field in the wave while maintaining the same electric field. One can do this by exponentially increasing the amplitude of the side band (or keeping a continuous amplitude higher in the side band, than the one in the wave periods of the carrier wave) during a wave period then every 3 wave periods after that period, so a increase on wave period 1, period 4, period 8 then 12 and so on. Another way to state this would be to make the cosine wave (sideband) have a increased amplitude that is continuous or exponentially increased at half the frequency of the sine wave (carrier wave). This modulated wave could be at any frequency defined by whoever is transmitting the wave and building the circuit as long as it follows the formulas above and below. This will match with the inductance of the inductor of the LC circuit in the next part of this essay and start to resonant amps by a steady increase of amps in sync with its inductance of the electrical field. The formula for this is (shown in the diagram below).

[I=(T+3)-r] = [(f+I)-r]= AM modulated wave

This formula shows what the wave would be if sine and cosine were one. Whereas I equals amps, r equals resistance, f equals carrier wave frequency, T equals wave period and a v not shown here (but in the diagram) next to the (I) in the equation to show exponential increase. This formula is for when it is applied to the circuit below otherwise it is just I without resistance plus f without resistance

[I=(T+3)] = (f + I)= AM modulated wave

Thus when it is put in to the technical formula for a sine wave (carrier wave) and cosine wave (sideband) it would appear as the y(t) modulated signal formula in this reference site on AM modulation [5]. Though the M in the formula would have a exponential increase and the cosine wave would be divided by two as to make half the sine wave. This is shown in another diagram below. Note: V still stays as the symbol for exponential increase

2. Methodology

This in itself (the wave form above), in a resonance circuit, would increase power output but, this isn't enough to get a suitable power output. We need something that will resonate this wave and will also increase the voltage of this wave. So the next step is to construct a receiver that has antenna leading into a LC circuit to pick up this waveform. [6] This circuit will resonate at the carrier wave and sideband (at this time no amount of hertz or amplitude has been identified for the carrier wave or sideband thus the variables of the capacitor and inductor of the LC circuit hasn't been defined) but, follows the sideband/carrier (modulated wave) wave formula above. First you'll need to make a tank circuit that will handle the frequency you decide to use as the carrier wave with formula for the side band. Thus the measurements for the capacitor and inductor will be based on this frequency. After you do this make a lead to ground. Then put a primary coil that acts like a step down transformer that couples next to the inductor of the LC circuit and is adjacent to the inductor of the LC circuit. The wounds in the primary should be half of the ones in the inductor so as to increase the amps inducted from the inductor of the LC circuit. From this point take the output from this coil and lead to a secondary coil adjacent to the primary coil (making sure that the lead is in the direction of induction or polarity of the secondary coil so as to match the induction and subsequent magnetic field of the LC circuits inductor and primary coil) that thus couples with the primary coil. This secondary coil acts as a step up transformer with winding a half more than that of the primary coil so as to increase voltage from the induction of the primary on the secondary. Then take the output of this coil and lead it back to the primary coil again and then back to the secondary coil at the same time having the same lead back to the secondary coil also lead to either a full wave bridge rectifier (if you plan to use this circuit for a DC current device) or to a resistor specified for the loads power specifications, if a resistor is needed to cut down on current. Then lead this to a load and from the load to another resistor that is the same specification as the one before the load. That is if it's not with the full wave bridge rectifier for DC current (other being AC current). If it is a AC circuit lead the connection to a intersection that goes back to the lead from the primary coil and the other lead from this point to ground. This is where, with the AC current the coil configuration can power the opposing cycle (positive to negative) and when the cycle is negative to positive the current is lead to ground. With the DC current circuit, one should, after the rectifier, place a resistor to the specifications of the load with a capacitor before the load then one after the load before it is lead to ground so as to keep the current even and un-choppy. The reason for the step down and step up transformers by half is to keep in multiples or divisible of 2 so as to make the frequency change from what the inductor of the LC circuit is producing in sync with each other so as to create even more resonance (in amps) and voltage increase for a overall wattage output. All coils in the circuit (inductor, primary and secondary) are RF coils. If this system works, the modified circuit and its adjacent amplitude modulation wave coming from a transfer (transmitter), should increase wattage exponentially to any desired amount for a load with a exponential increase of amplitude from the modulated wave and the circuits in the circuit design described above. This is because the circuit causes resonance of amps and voltage while cycling the increase though its coils over and over increasing the wattage exponentially. This circuit and wave form would be able to work with many devices. Plus the transmitted wave could come from any source with any distance of transmission that is decided (as long as the distance is acceptable power density under FCC regulations). The systems mathematical increase would be comparative to the Fibonacci number [7]. The schematic for both the AC circuit and DC circuit is included with this essay.

3. Result, Discussion, Conclusion and Claims

Hypothetically, without a proper test, I suggest that the LC circuit will pick up the designated frequency with sideband adjustment and the primary coil will increase the amplitude (the magnetic field)(though resonance of the inductor of the :C circuit and the primary coil being comparative to a step down transformer) and the secondary coil will increase that current in electrical field (voltage) by running the current from each though each other coils twice thus causing a exponential increase in wattage in the overall circuit. That is with whatever exponential increase that is coming from the resonance of the LC circuit and the frequency itself. Taking small amounts of energy in a radio wave and boosting it to usable wattage for any load one would wish to use while still following FCC guidelines for safety. Making this technology great for commercial applications as well as the aerospace industry.

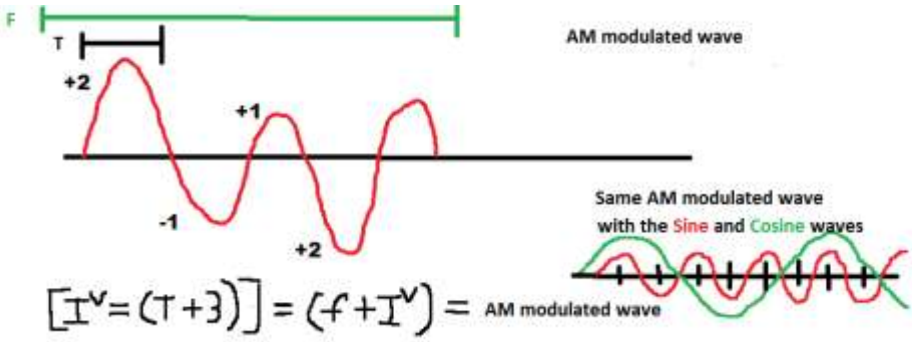
References

[1] https://en.wikipedia.org/wiki/Wireless_power_transfer the Wikipedia contributors, Wireless power transfer, Wikipedia free encyclopedia 2017, accessed 2017

[2] https://www.google.com/patents/US7288918 Michael Vincent DiStefano, Wireless battery charger via carrier frequency signal, United State Patent and Trademark Office, US7288918 B2 Oct 30, 2007, accessed 2017

[3] http://hackaday.com/2017/02/23/suddenly-wireless-power-transmission-is-everywhere/ Brian Benchoff, Suddenly wireless power transmission is everywhere, Hackaday.com, 2017, accessed 2017
[4] https://en.wikipedia.org/wiki/Resonance the wikipedia contributors, Resonance, Wikipedia free encyclopedia 2017, accessed 2017
[5] https://en.wikipedia.org/wiki/Amplitude_modulation#Simplified_analysis_of_standard_AM the wikipedia contributors, AM modulation, wikipedia free encyclopedia, accessed 2017
[6] http://physics.info/circuits-rlc/ Glenn Elert, LC circuits, The Physics Hypertextbook, 1998-2017, accessed 2017
[7] http://mathworld.wolfram.com/FibonacciNumber.html Eric Weisstein, Fibonacci Number, Wolfram Research Inc, 1999-2017, accessed 2017

Note: Change the resistors to potentiometer that are connected to each other to change with the same value when adjusted to have a circuit that you can control the amount of watts being used for a load.



$$[I^v=(T+3)]]=(f+I^v)=$$ AM modulated wave

I=Amps, v=expontential increase, T=wave period, f=frequincy

Sine Wave:

$$c(t)=A\cdot\sin(2\pi f_c t)$$

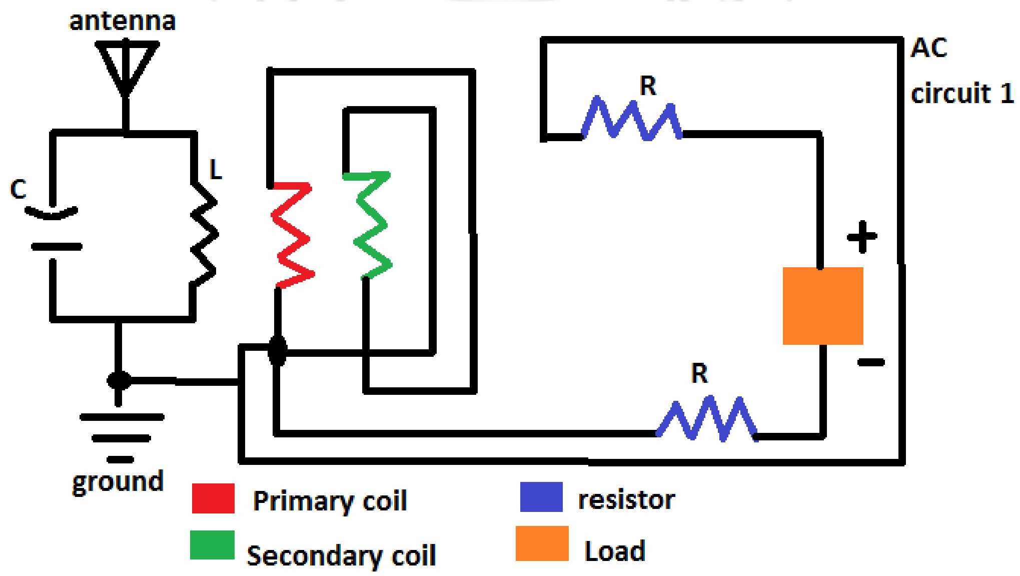
Cosine Wave:

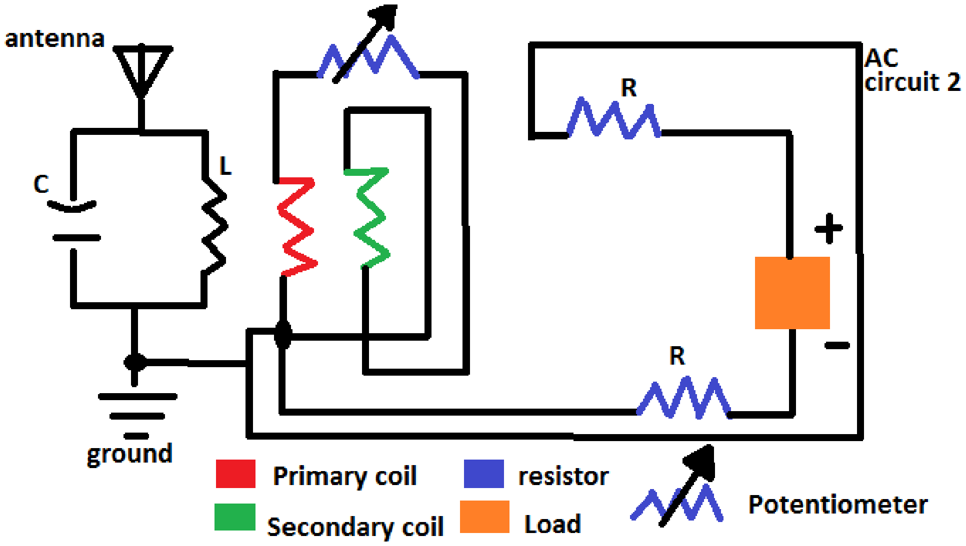
$$m(t)=M^v\cdot\sin[2\pi(f_c\div 2)t+\phi]$$

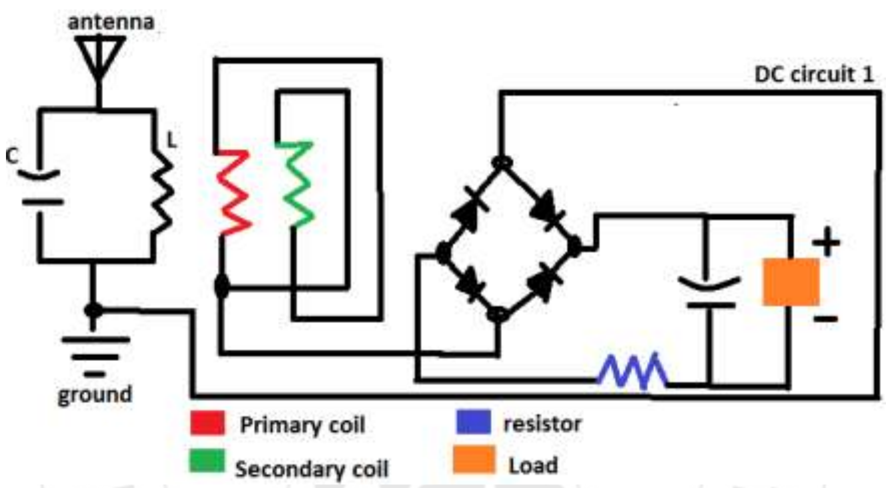
AM modulated wave y(t):

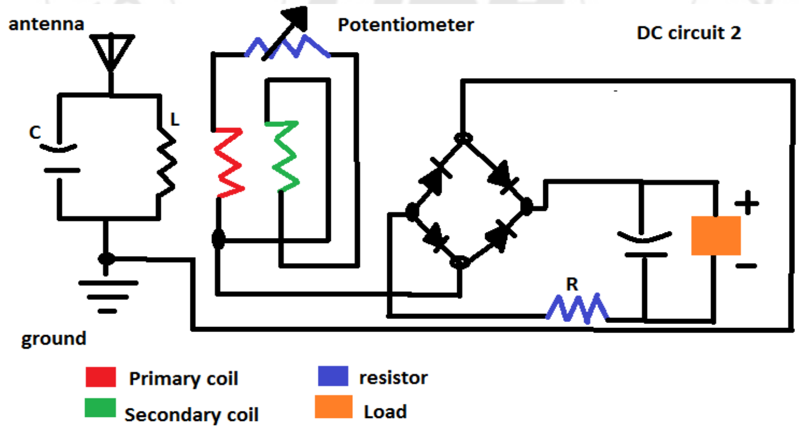
$$y(t)=m(t)\cdot c(t)$$

Note: v = expotiential increase
m (t) =cosine wave c(t) = sine wave









Author Profile

Jonas Tyler Doran, 37 year old male from Barberton Ohio, United states of America. I have schizoaffective disorder and is on the federal welfare system. He went to college briefly (unaccredited) for psychology and physics. I got into other disciplines of science on my own after that stopped going to college. With this paper I hope to fulfill the dream of Wireless power transfer that Nikola Tesla had with his Tesla Tower. I also hope to get industry interested in the concept for testing and development so that the world can have power sources that has no need for wires. This article has been posted on my blog site and wordpress.com, on Linkedin and on Facebook but till this point in time, hasn't been published in any journals. The only competing interest or regulations to this concept would be the opinions of Community Support Services in Akron Ohio, The federal Social Security Administration, Jobs and Family services of Summit county and Akron Metropolitan Housing Authority of Summit county. Though these are more of finical restrictions than restrictions of publishing content or research.