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Physics II

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Honors Project: Tesla Coil

Introduction

The Tesla Coil is a high-frequency alternating-current transformer (Dommermuth-Costa 1994, 75). The coil is set up to discharge its charge using a Jacob's ladder design. This means, instead of a sphere on which charge is collected, there are two wires sticking up, but not touching each other, up which the charge travels. After a certain amount of charge has been generated, the charge is "discharged in the form of electrical arcs," also know as lightning (Tesla Society of New York 2010).

The Physics

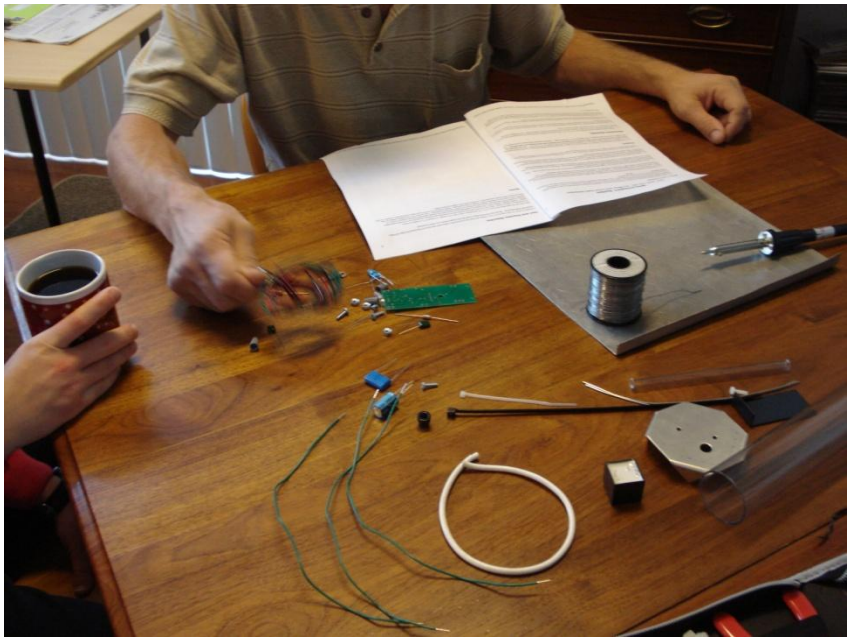
Overall, the coil takes 12 – 14 volts DC and 1 - 2 amps to operate (Information Unlimited 2010). The kit comes with a transformer of 14 volts DC and 1 amp which is plugged into a wall outlet. From the 14 volts, the coil takes DC and oscillates it to create an output voltage somewhere between 5000 and 7000 volts at 40 kHz (Information Unlimited 2010). This is achieved through a series of resistors, a power transistor, capacitors, an inductor, wires, and a high-voltage, high-frequency transformer. Using the capacitors, resistors, and T1 feedback in the circuitry, this causes the power transistor to create the 40 kHz. (T1 is labeled on diagram below.) The high voltage transformer creates the 5000 – 7000 volts by the transistor being turned on and

off. Below is a diagram of the circuit that came in the assembly manual with some modifications (author unknown 2007, 6):

The Assembly

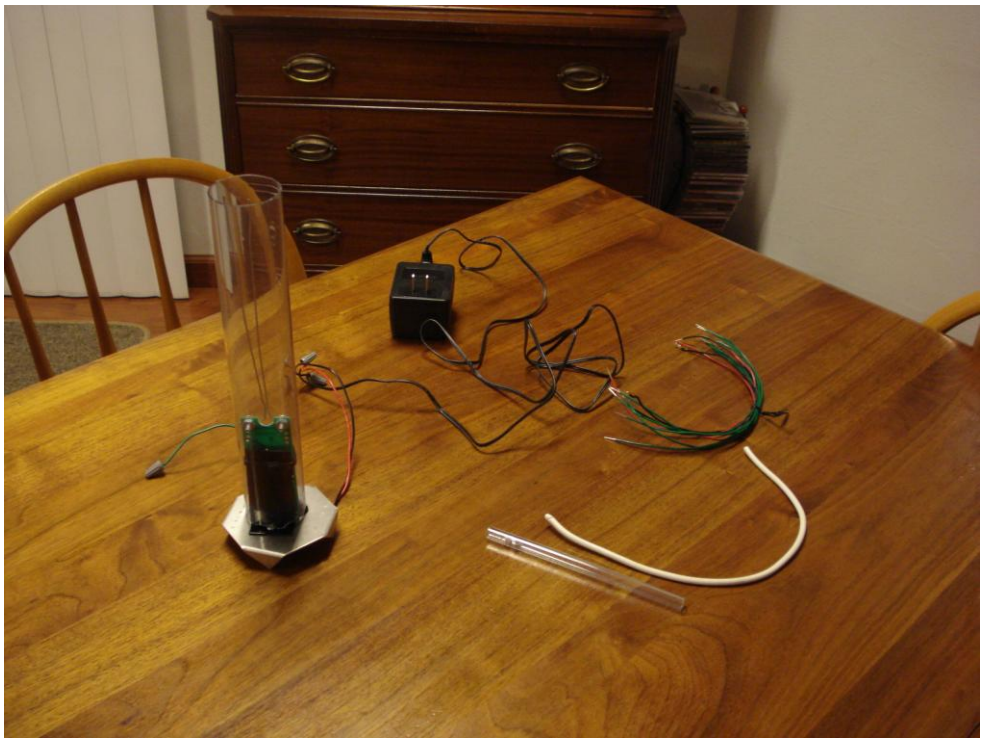
When the kit was first opened, one could see there was a lot of assembly necessary. There was a flat piece of green plastic with silver lines also known as the circuit board. In a bag, all of the resistors, wires, the transformer, the inductor, and some other items were all jumbled together. These were the pieces that made the circuit board into the desired coil. First, the contents of the bag were sorted and organized. The lengths of wire were grouped by color, the resistors by size, and then everything else gained its own little area on the table. Next, the manual was consulted. One had to do some translating to understand what needed to be done. After comprehension, one started soldering and hoping that the work was correct. Through trial and

error and some modification once the mode of discharging was decided upon, the coil was made to work. After the circuit board was assembled, one had to mount the circuit board to a metal base plate. One was provided with a rectangle of black plastic which was bent at one end. The bend was large enough to contain a hole for a screw that went into the metal plate. One zip tied the circuit board to the black plastic. Next, there were more wires to connect. There was a ground to attach to the screw keeping the black plastic and the metal plate together and have the wire ready to be grounded. There were also a red wire and a black wire. These were connected to the 14 volt transformer. Finally, one was given a clear plastic tube slightly larger than a paper towel tube and just large enough to slide over the circuit board and the black plastic. One had to cut notches into the bottom of the tube for cooling purposes.



Conclusion

A Tesla coil was successfully made using a kit and one's brain. There was some hang ups, but one overcame them. Building this coil expanded one's knowledge quite a bit.



Works Cited

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