Tesla Coil

Anthony Douglas

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Nicola Tesla was one of the forerunners in wireless technology and electrical engineering. Among one of Nicola Tesla's most prominent inventions was the tesla coil. With the tesla coil, Tesla demonstrated multiple groundbreaking discoveries that have made him so famous. Among these many discoveries were the ability to transmit power wirelessly and the ability to transmit information wirelessly from one point to another. "As soon as [the Wardenclyffe facility is] completed, it will be possible for a business man in New York to dictate instructions, and have them instantly appear in type at his office in London or elsewhere. He will be able to call up, from his desk, and talk to any telephone subscriber on the globe, without any change whatever in the existing equipment. An inexpensive instrument, not bigger than a watch, will enable its bearer to hear anywhere, on sea or land, music or song, the speech of a political leader, the address of an eminent man of science, or the sermon of an eloquent clergyman, delivered in some other place, however distant. In the same manner any picture, character, drawing, or print can be transferred from one to another place ..." – Nikola Tesla, "*The Future of the Wireless Art*," Wireless Telegraphy and Telephony, 1908, pg. 67-71.

Nicola Tesla was a visionary of his time with a massive goal. That goal was the ability to wirelessly transmit data from one point over a long distance to another point. He also wanted to be able to power items without the use of wires. Although his original ideas never came to fruition, his mark on history can be seen today with computers, cell phones, and the World Wide Web.

A Tesla coil is one of the most fascinating electrical display devices to be seen in operation. A large unit can produce a continuous spark exceeding the height of the coil. Electric discharge simulating lightning bolts will produce cracks of noise louder than a

rifle shot. These sparks, as well as being very impressive and attention getting, can produce bizarre effects in most common materials. For example, wood can explode into splinters or made to glow with an eerie reddish light from within. Insulating materials seem to be useless against this energy. Lights energize without wires, sparks and corona in the form of St. Elmo's fire occur within proximity of the device. High energy electric and magnetic fields render electronic equipment useless. Phenomena not normally associated with standard HV electricity become apparent in the form of many weird and bizarre effects.

A Tesla coil is a high frequency resonant transformer. It differs from a conventional transformer in that the voltage and current relationships between primary and secondary are independent of turn's ratios. A working apparatus basically consists of a secondary coil (LS1) and a primary coil (LP1). It is obvious that the primary circuit is capacitance dominant and tuning the primary circuit via taps along the primary coil alters the frequency accordingly. However, this relatively fine-tuning of the primary circuit to the secondary is mandatory for proper operation. Force driving (untuned) the secondary coil will produce hot spots and interwinding breakdown along with other negative results.

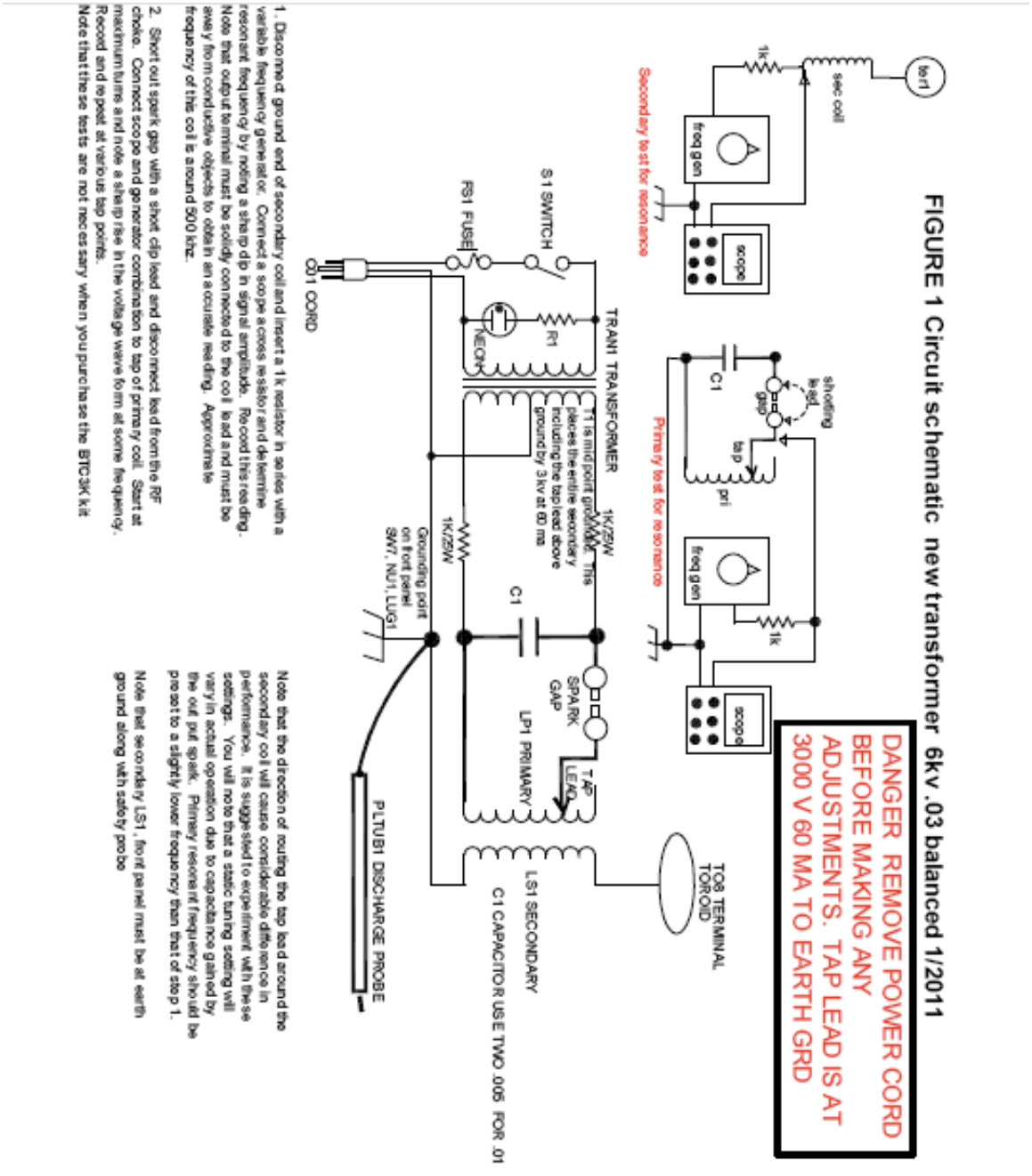
The tesla coil that I built can develop voltages up to and in excess of 250,000 volts. This is the value need for direct current voltage to produce an arc length of 12 inches. This amounts to about 6,000 volts at 30 milliamps from the 115 alternating current line.

A secondary coil of 500 turns was used in the construction of this particular tesla coil. This coil has an inherent resonant frequency that's determined by its inductance and capacity usually around 500 KHZ. The primary circuit should also have a resonant frequency equal to that of the secondary coil for maximum performance. The primary

coil has an adjustable tap that allows for the fine-tuning of the coil. However, it should be noted that it doesn't take a lot of added capacitance to change the secondary resonance point.

The transformers supply the high voltage that is used in the coil. The voltage charges the primary resonating "tank" capacitor to a voltage where it fires the spark gap producing an impulse of current through the primary inductance where oscillations take place. The frequency is then determined by the inductance and capacity values of the primary circuit. Voltage output of the secondary coil is usually approximately related to VP(C1/C2), where VP is the spark gap discharge voltage, C1 is the primary capacity and C2 is the secondary coil capacitance.

The following is the full detailed schematic of the tesla coil built.



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