

FREE NOTES ON ELECTRONICS

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Electronic gas igniter (made in China of course)



Fig.1

Few days ago I've bought an electronic gas igniter for kitchen use (priced 1Euro!). The device is powered by two LR6 1,5V batteries and produces nice looking 5mm spark with repetition rate of about 40ms. My first thought was that it seems to be very similar to an electric paralysar used for self defence. I decided to buy 5 of them and do some reverse engineering.



Fig.2

As You can see it's a very simple but interesting solution of generating high voltage pulses.

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Fig.3 PCB and HV transformer

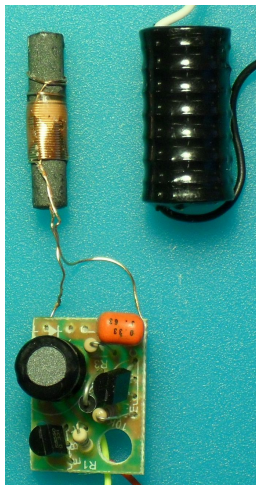


Fig.4 Primary winding of HV transformer

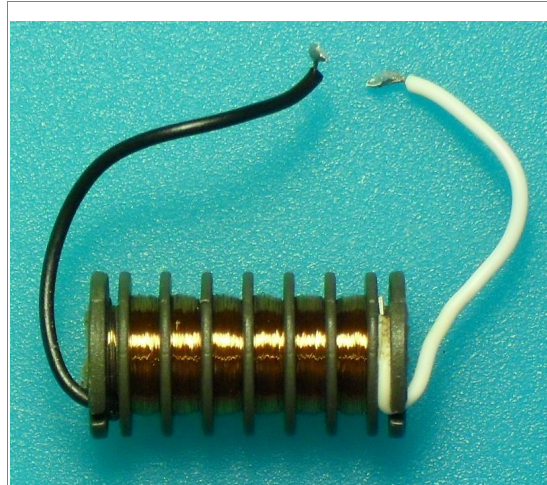


Fig.5 Sectioned secondary winding of HV transformer

Inside there are two inductive components: HV transformer with sectioned secondary winding and small sized transformer which looks like typical choke used in SMPS power supplies.

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The schematic of an electronic circuit is presented below.

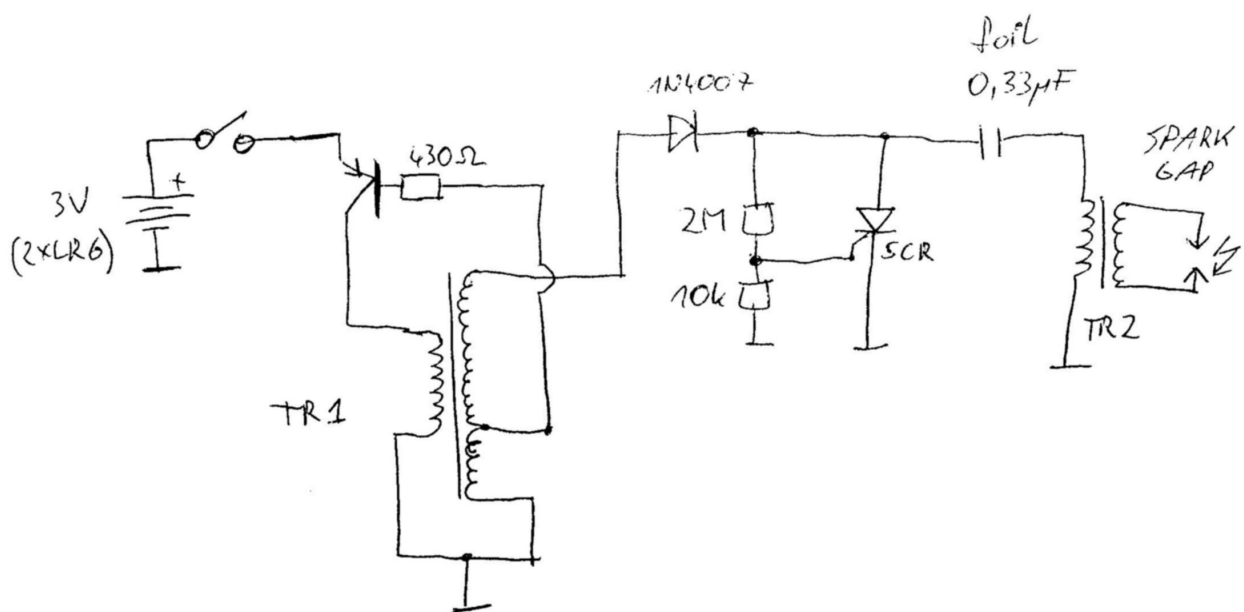


Fig.7 Schematic diagram

Transformer Tr1 and PNP bipolar transistor form saturated core oscillator (blocking oscillator) working on frequency of about 8kHz. Secondary winding of Tr1 generates pulses of current that are charging the 0,33uF (good quality) foil capacitor through the rectifying diode. The voltage on the capacitor rises until potential of the SCR's gate reaches 0,7V (and SCR's gate threshold current is reached). In that moment the whole voltage collected on capacitor's terminals (about 200V) is being applied to the HV transformer's primary winding. Assuming the transformer's windings ratio of 40, the output voltage can reach 8kV. The secondary winding is divided into 6 sections, so the voltage on each section's wires does not exceed 1,5kV to prevent internal arcing. In brief: the higher is the voltage the bigger is the air gap between. After discharging the capacitor the whole process continues. The spark appears with frequency of about 25Hz.

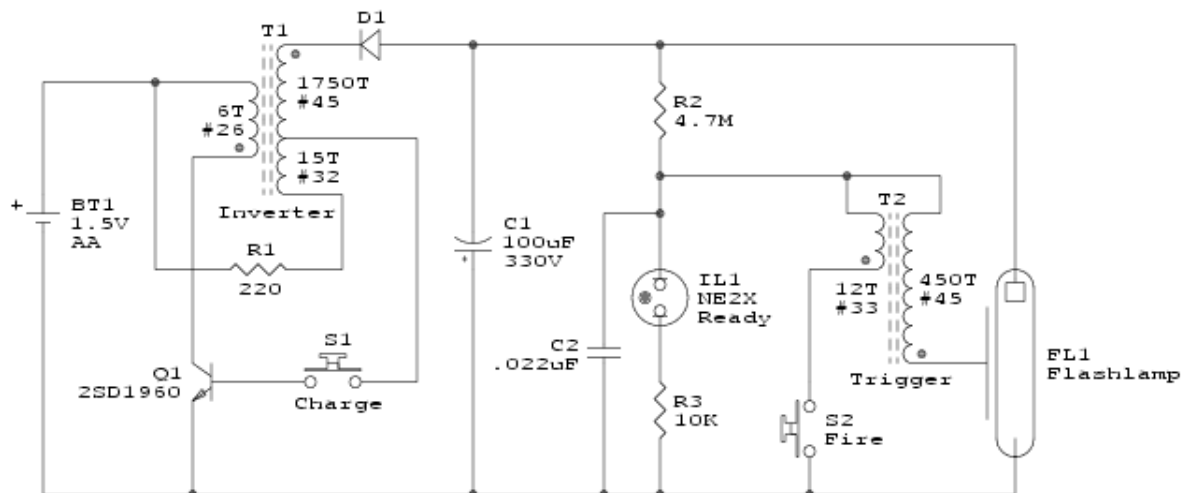
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It's worth attention that the spark's energy is quite high – it's value is close to the energy stored in capacitor $E=(CU^2)/2$.

The Tr1 oscillator is an interesting design especially for it's simplicity.

The oscillator is very similar to that used in battery powered photo flash lamps.



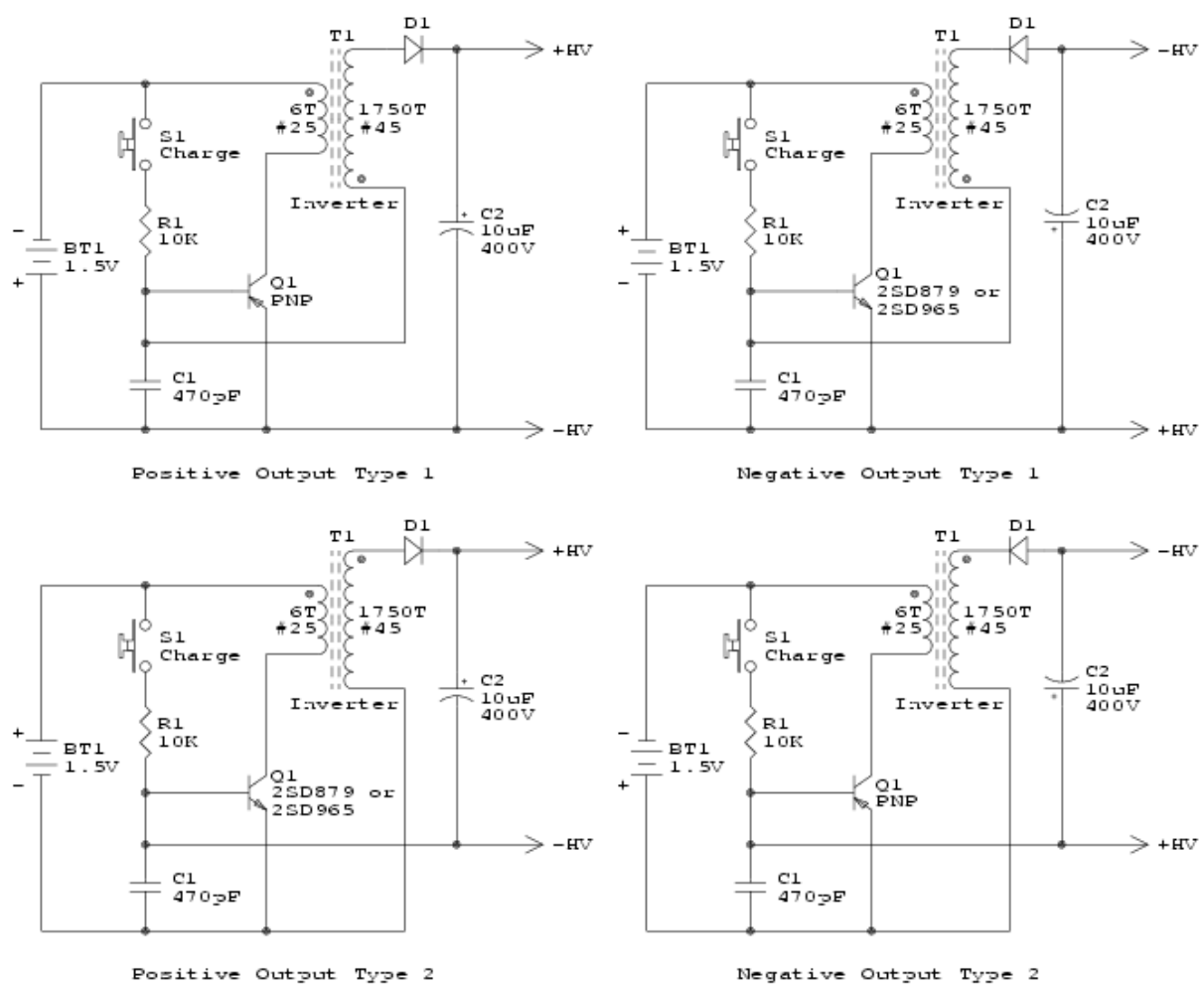
Fuji Flash Unit 1

Fig.8 Flash lamp circuit, source: "<http://www.repairfaq.org/sam/kflashf.gif>"

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I can't help presenting another brilliant idea. It's another flash lamp charging unit, but I bet – it's the simplest solution.



Ultra-Compact 350 V Capacitor Charger

Fig.9 , source: " <http://kellerstudio.de/repairfaq/sam/uc350vc.gif> "

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At the end let's look at typical stun gun (electric paralyzer) schematic.

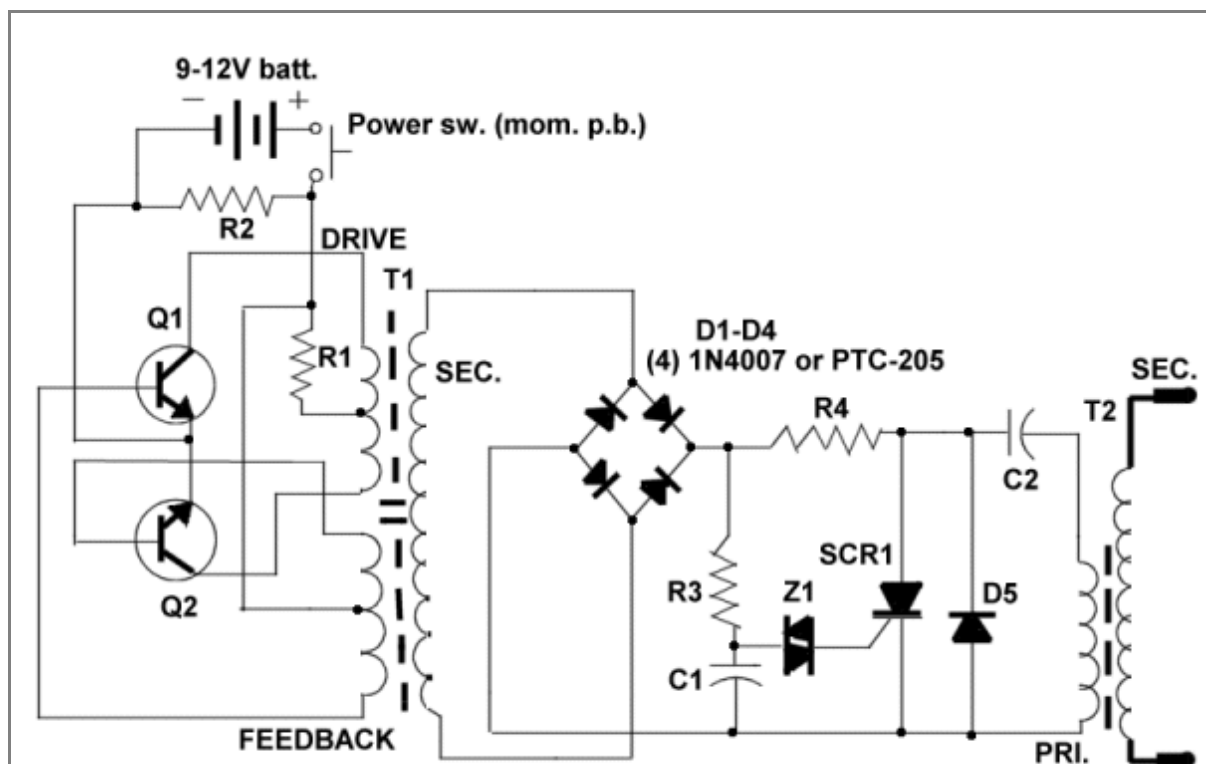


Fig.9 Electric Stun Gun schematic, source : "<http://www.freeinfosociety.com/electronics/schematics/weaponry/pictures/stungun3.gif>"

**ANY. COMMENTS.
AND. SUGGESTIONS.
ARE. WELCOMED.**