

Nitrogen Laser

Technoclub Project

Something about lasers....

This is an idea implemented by a MIT graduate student in 1974, that came as a Scientific American article that year.

A laser is basically, several different light waves of the same frequency and phase difference, emitted together.

In our project we ionize nitrogen by a large voltage. There is only nitrogen in the chamber that we ionise, and all the atoms excite at the same time with the same frequency, all at once. This means that they all will be in phase with each other, and so we would get a laser.

But yeah we need a nitrogen environment for this to work.

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Our Laser

A graduate student once built this laser in his garage with basic things found in his life. With some wishful thinking, we believe that this would work the same way for us. We do not make any changes to the basic design, but functional changes to fit our pocket.

The end result will be a laser that emits UV pulses , few nanoseconds long, for some time and then stop. We must be aware of the fact that UV is dangerous to the eyes, and use safety goggles that protect from UV when we start the laser.

How the laser works.

We use a 6V battery to get a 20,000 Volt power supply using a transformer circuit.

Next, we ionise the nitrogen with the large voltage. The nitrogen is kept inside a chamber. Only one end of this chamber has a glass slide opening which the laser rays can pass through, all other sides are covered by what is called as plexiglass, which does not let UV pass through it.

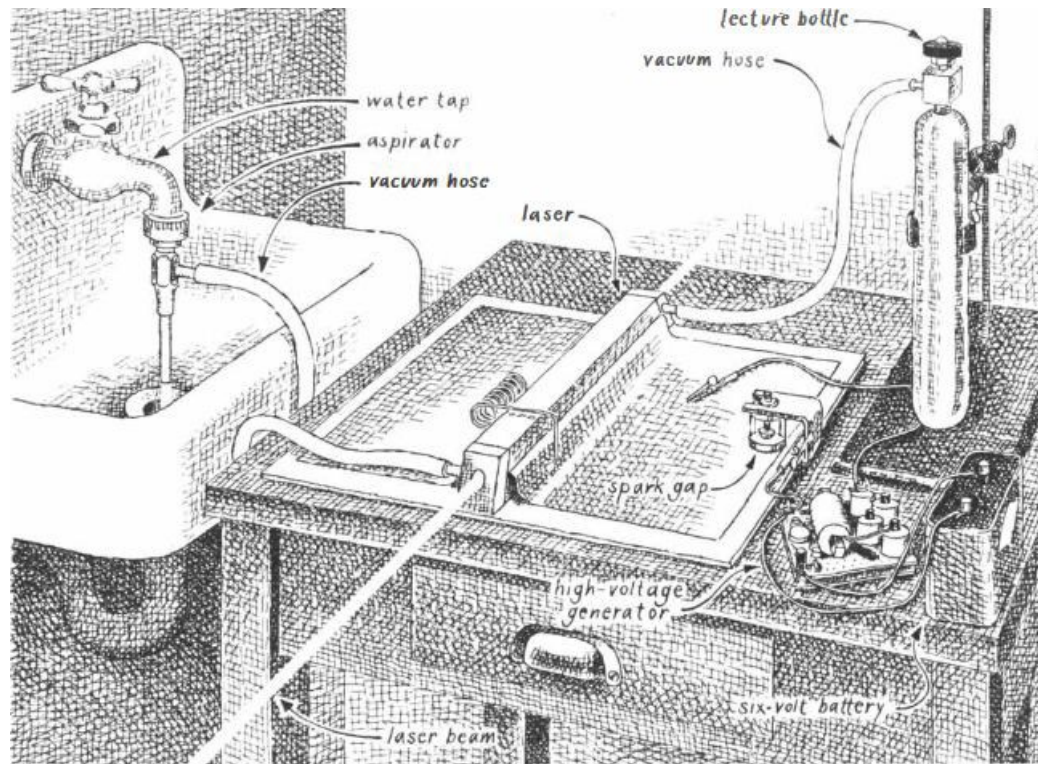
The circuit is very special. It is designed in such a way that it starts the laser for a few nanoseconds, then stops for a while, then starts again, stops and continues this process (until the battery is dead)

Details about the circuit

For the power supply, we can either make the circuit ourselves referring to the procedure given in the 1974 Scientific American article. But these days, readymade power supplies that can convert a 3V to a 400,000 volt output are available, which are very very cheap.

The circuit for the laser , that is connected to the power supply, is given on the next page.

Laser Overview



James C. Small's nitrogen laser

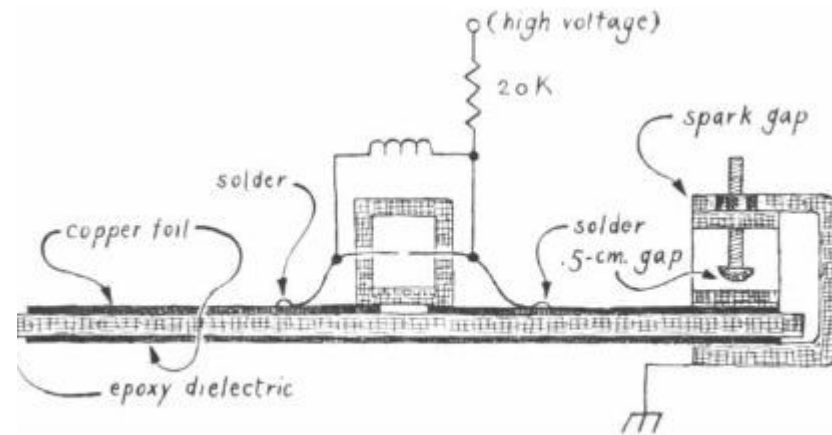
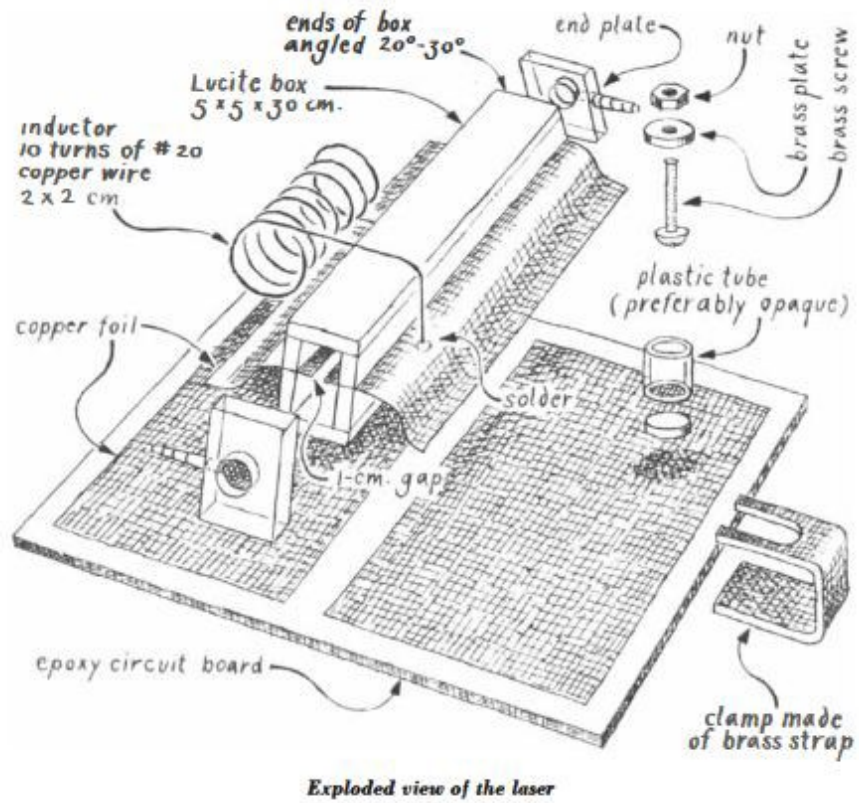
Description of their work

1. A rectangular chamber is made with two ends such that gas can be passed through it, with pressure. Gas enters and leaves the chamber.

Alternatively you can seal the chamber with pure nitrogen. But perhaps this wont be much effective.

1. The circuit is made with epoxy board and copper foils as shown in the next page.
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The copper and the board



The apparatus in elevation:

The working of the circuit

The copper plates act like a capacitor. There is a coil which is connected to these plates in some specific manner such that the whole circuit intelligently stops after a few nanoseconds. To know how it works, refer to the original Scientific American article.

https://www.jstor.org/stable/pdf/24950104.pdf?refreqid=excelsior%3A64ce7ec79edf86f464eb98c9c25f8e43&ab_segments=&origin=&initiator=&acceptTC=1

How to make it

To make this circuit, we first make a list of the things we need to purchase, then jot down the procedure we must follow in order to complete the circuit.

Item	Description	Cost
epoxy double board (2)	30*45cm	500
Plexiglass	0.65*14*10cm	2000
silicone seal		300
end plates	1inch thick acylic, 2''*5''	500
glass microscope slides		-
paraffin wax		30
copper foil	at least 50 microns thick	1000
brass/copper plate for clamp	3-4mm, 1"width, 6"inch	400
soldering rod		-
bolt roundhead -2inch		50
power supply		500
nitrogen		-