

ELT 101: Basic Electricity: AC/DC

LAB 10-1: Safety pin motor

Objectives

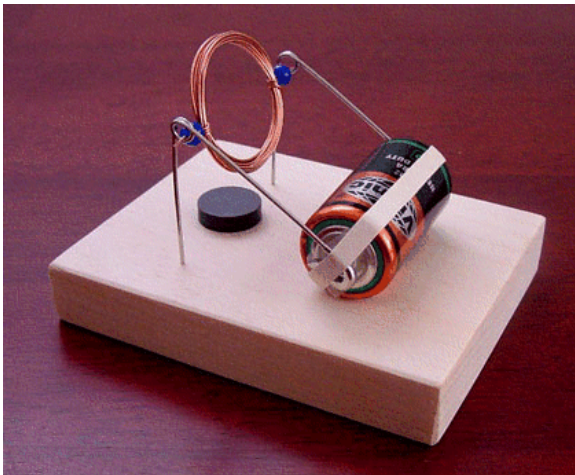
- 1) Given the parts, construct a safety pin motor.
- 2) Use a safety pin motor to investigate current direction as it pertains to electromagnetism.

Equipment and materials

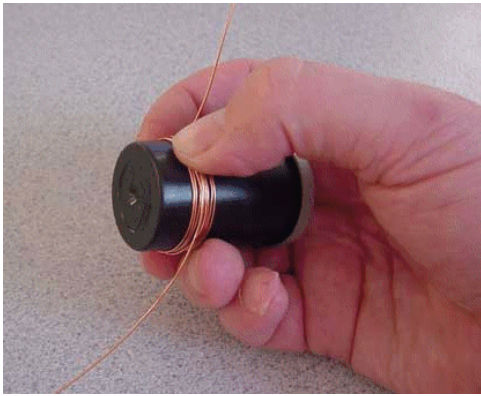
- 1) Safety pin motor kit
 - (2) safety pins
 - (1) wood base
 - (2) glass beads
 - (1) 1.5V D cell
 - (1) magnet
 - (1) rubber band

Procedure 1: Build a simple DC motor

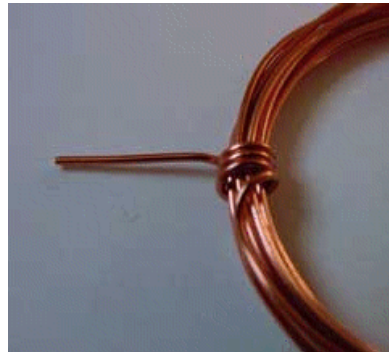
- 1) The photo below is of the completed motor. It consists of a pair of safety pins pressed into a wood base, a coil of wire, two glass beads, a magnet, a battery and a rubber band.



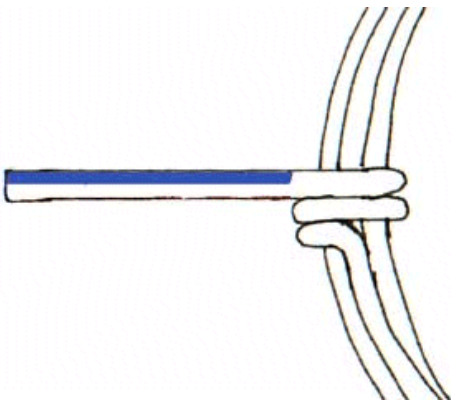
- 2) To build the motor, start by winding the coil. With a 4 foot piece of magnet wire, make a right angle bend about 3 inches from one end of the magnet wire. Starting with the bent end, wrap the wire around the D cell battery leaving at least three inches free at the end.



3) Next, hold the coil so it doesn't unwind and wrap about three turns of the bent end of the wire tightly around the coil. Then wrap the free end several turns around the other side of the coil. The balance of the coil is important so try to get the two wire ends on directly opposite sides of the coil. Use wire cutters to trim the wire ends approximately $\frac{5}{8}$ " long

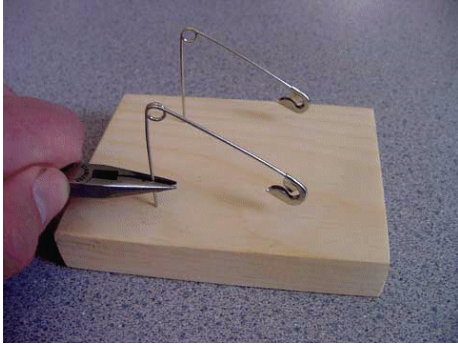


4) Now scrape or sand the insulation off of ONE side of each of the wire ends. See the sketch below. If you are using a utility knife to remove the insulation, try scraping with the back of the blade.

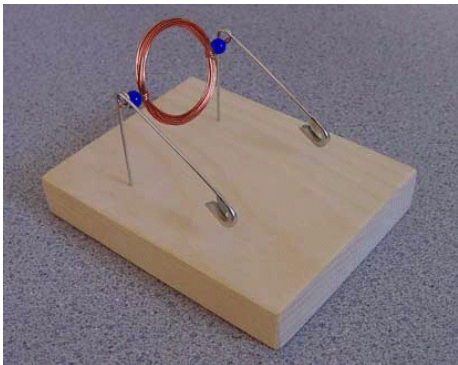


Scrape the insulation off the top side of both wires. In this picture, bare wire is blue.

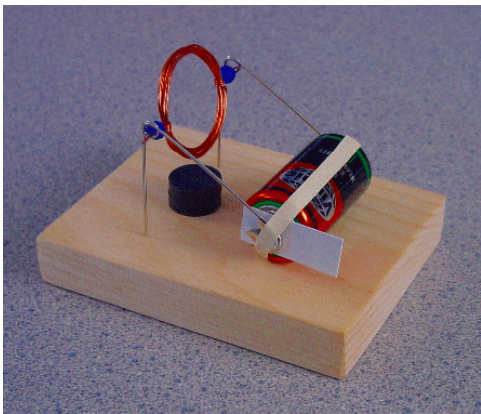
5) Open the safety pins and spread them open a bit. Insert them into the base two inches apart (the width of the battery) as shown in the photo. Hold the pliers close to the point of the pin as you push it into the wood.



6) Slip a bead over each end of the wires on the coil and gently spread the safety pins apart and slip the wire ends into the loops of the safety pins. Adjust the balance of the coil by bending the wire ends or sliding the wrapped ends up or down slightly. Once adjusted the coil should spin freely when you give it a spin. If the coil won't spin freely, the motor won't work.



7) Slip a rubber band over the battery and slip the battery between the heads of the safety pins with the rubber band holding the battery in place. Place the magnet between the two safety pins. Your motor is now complete.



8) If your motor is especially well balanced the motor might start spinning right away. If not, give the coil a spin in either direction. The motor will either speed up or slow down and reverse direction.

Briefly describe how this simple DC motor works.

Procedure 2: Analyze current direction versus motor direction

- 1) Remove the battery and connect it back to the motor, but this time with the opposite polarity.
- 2) Turn the motor on.

Did the motor's coil change direction?

Why/Why not?

****** end of lab 10-1 ******