CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY

Name(s)
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Project Number
J0738

Project Title
Magic Magnets: Construction and Testing of a Homopolar Motor

Abstract

Objectives/Goals
Make a rail gun using a homopolar motor move on its own and do different tests to see what factors affect its performance.
If the current and number of magnets are increased, then the speed will increase; if the slope is increased, then the speed will decrease.

Methods/Materials
I made the track by taping two strips of foil down on a piece of wood. I made the car by putting four disk magnets on either end of a steel rod. Then I hooked up the two strips of foil to the + and minus of a power source. I hooked up different amounts of resistors to test current, I raised one end of the track to test slope, and I put different amounts of magnets on the axel to test the number of magnets.

Results
My tests on current were very accurate, which is surprising because there are other factors like friction and human error that I didnt account for. I came to this conclusion by picking one of my measured data points and putting it into the formula and then solving so that I could see if the shape of the line was right. My tests on slope revealed that with 2 ohms of resistance, the railgun could only go up a 2.8% slope. My tests on number of magnets showed that to get the best speed, it has to be a compromise of mass and flux.

Conclusions/Discussion
I can conclude that two out of three of my hypotheses were correct: When more current was added, the cars speed did increase, when the slope of the track was increased, the cars speed decreased. But, when more magnets were added, the speed of the car did not necessarily increase. This was because it needed to be a compromise between mass and magnetic flux. The more magnets, the higher the magnetic flux, but the higher the mass, causing the axel to accelerate more slowly.

Summary Statement
I constructed a homopolar railgun and tested current, slope and number of magnets to see how they effected it's performance

Help Received
Dad helped understand some formulas and format my graphs on the computer; Mom helped design my diplay board.