CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY

Name(s)
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Project Number
J0220

Project Title
Roll... RUMBLE: An Experiment on the Factors that Affect the Unlocking of Magnetic Potential Energy

Abstract

Objectives/Goals
My objective is to explore the unlocking of magnetic potential energy. Using a magnet-gun, I examined two questions: Will changing the distance between two magnets affect how fast the last ball shoots out? Will using additional magnets affect how fast the last ball shoots out? Correspondingly, the two hypotheses for this experiment are:
Hypothesis 1: As the inter-magnet distance decreases in a two-magnet case, the last ball will shoot out faster. Hypothesis 2: As more magnets are added, keeping the distance between the original outermost two magnets the same, the last ball will shoot out faster.

Methods/Materials
Materials: 5 magnets; 9 iron balls (half-inch diameter); Wooden track (79" long); Tape measure; Wood glue; Spirit level; Pencil.
Procedure:
For hypothesis 1, using a wooden track, two identical magnets were placed 16" apart on the track with two identical iron balls on the far side of each magnet. Another identical iron ball was released from the closer side of the first magnet; this ball was at rest and was just within the magnet's range of influence. When released, this ball was attracted towards the first magnet and eventually struck it resulting in a chain of events that ended in the last ball on the far side of the second magnet shooting out. The distance traveled by the last ball was recorded. 9 more trials were conducted in the same manner, for a total of 10 trials. The measurements from the 10 trials were then averaged. Identical steps were performed for inter-magnet distances of 14", 12", 10", 8", 6", 4", and 2".
For hypothesis 2, the same procedure was performed and the distance traveled by the last ball was recorded in 10 trials with two magnets placed 12" apart. The measurements from the 10 trials were then averaged. These steps were repeated with 3 magnets, 4 magnets, and 5 magnets, without changing the distance between the original two outer-most magnets.

Results
As the inter-magnet distance was decreased, the last ball traveled longer distances, indicating that the ball shot out faster. Also, as the number of magnets was increased, keeping the same distance between the outer-most magnets, the last ball traveled longer distances, indicating that the ball shot out faster.

Conclusions/Discussion
The data support both the hypotheses. My experiment shows that magnetic potential energy can be an eco-friendly way of accelerating objects, such as satellites, in the future.

Summary Statement
This project explored the factors affecting the unlocking of magnetic potential energy by examining the distance traveled by the last iron ball at the end of a chain of events in a magnet-gun.

Help Received
Parents provided transportation and helped in constructing the wooden track.