CALIFORNIA STATE SCIENCE FAIR
2009 PROJECT SUMMARY

Name(s)
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Project Number
J1021

Project Title
Ratchet Up the Efficiency

Abstract

Objectives/Goals

Question: By decreasing the distance traveled and therefore decreasing the input force, can I make a more efficient human power generation machine?

Hypothesis: By using a ratchet and pawl pedaling system, I can make human pedal-power more efficient.

Purpose: To improve the generic pedaling system by using more efficient, human power generation with zero carbon emissions while running.

Methods/Materials

Materials:

Sheets of metal and wood. Copper wire and alligator clips. 12 electromagnets. 24 neodymium rare earth ½ in. disk magnets. A used bike frame with back wheel and good bearings. Fix-it-all (quick drying and setting cement). (2) 1 ft-long threaded shafts. 1 hinge. A wooden dowel (7/8 in.). A voltmeter. Welder

Method

Weld a bike frame (seat down) with a back wheel onto 2 metal plates. Bolt the metal plates onto a 4.5 X 3.5 ft. wooden platform. Mount a 2.5 foot long pedal onto the platform. Attach the end of the pedal to the bike pedal and attach the other end of the pedal to a spring on the platform. Fill the back wheel rim with cement and place 12 magnets on each side of the wheel. Cut 2 square wooden panels as large as the wheel and place them on either side. Firmly attach 6 electromagnets to each panel. Wire the electromagnets + to - and make the magnets alternating poles (N, S, N, S). Make a base piece for the panals and place them in. With 2 large threaded shafts with washers, bind the 2 panels together.

Results

Results: I got a maximum of 1.5 amps and 10 volts pedalling in parallel. In series I got .75 amps and 20 volts. Say, I pedaled in the "Far Position" of my pedal twice, I would get 4.5 volts.

Conclusions/Discussion

Conclusion: I found that by increasing the mechanical advantage of the pedal, making the wheel into the flywheel itself, and by using the wheel as the generator, one can create an efficient power generation machine. There are many modifications that can be made to improve it#s performance including: A wooden bike frame to lessen magnetic friction when the magnets spin, electromagnets without an iron core to further lessen magnetic friction, and more coils to increase the voltage made.

Summary Statement

My project is about making an alternating current human powered generator more efficient by using simple machines and kinetic energy storage

Help Received

Neighbor helped inspire ideas, helped with technical support, and lent out equiptment; Father helped solder, and assisted with constructing the apparatus.