

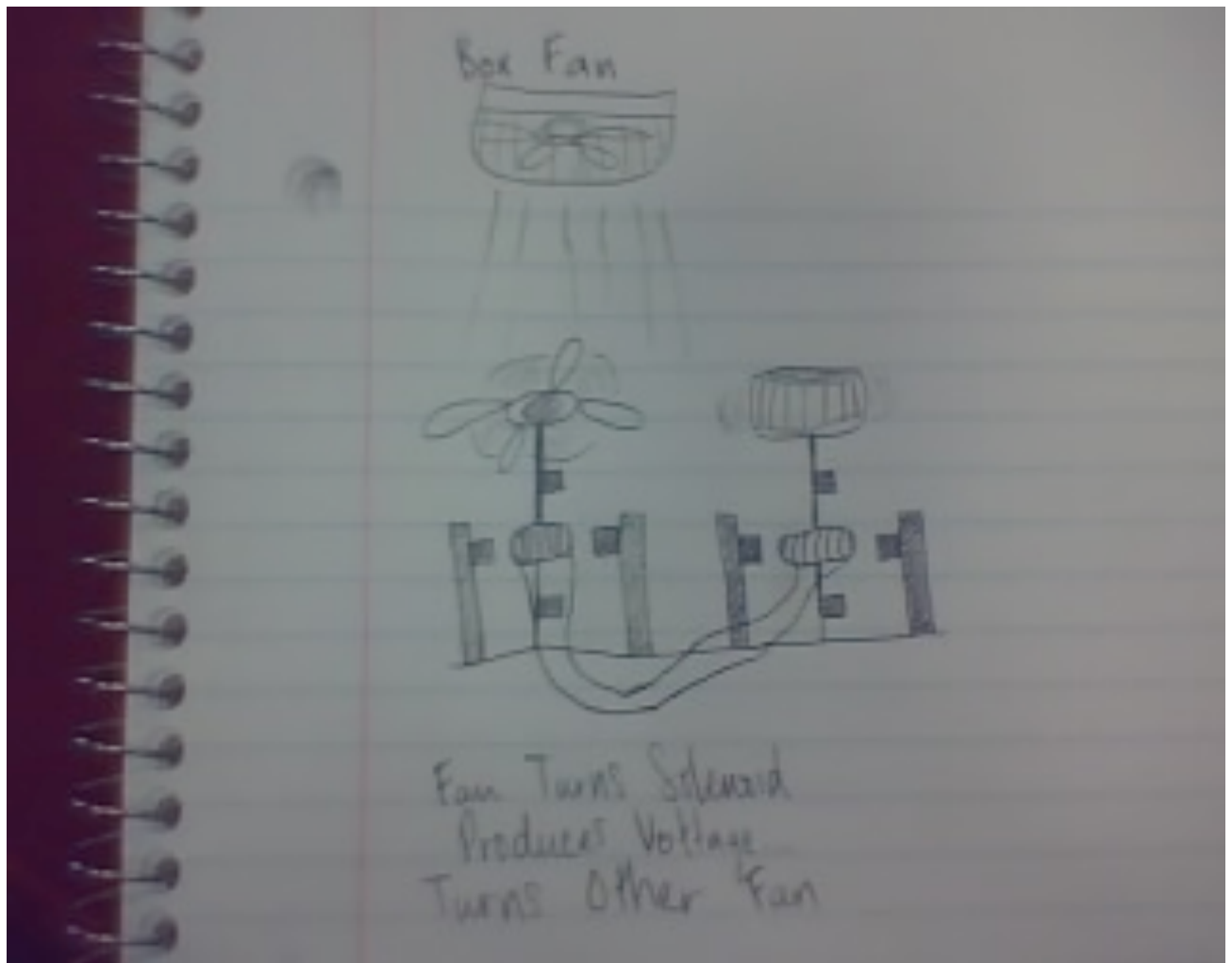
WIND-POWERED GENERATOR & MOTOR

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Objective

The objective of the undertaking is not only to create an efficient, working generator powered by wind, but also to use said generator to power a motor to create rotational motion of a fan attached. Furthermore, the efficiency of wind power will be evaluated qualitatively.

Diagram





Generator

Wind is produced near the blades of the fan, which spins the solenoid inside the magnetic field. The movement of the solenoid inside the magnetic field produces a changing flux. The changing flux, represented by a sine wave, produces a counter voltage to oppose this change in flux, which is called emf (electromotive force) (ξ). The voltage produced by the generator is used to power the motor on the other side of the device. Because

$$\phi = NBA,$$

$$\xi = -d\phi/dt$$

where N is the number of turns of the solenoid, of course, the more turns, the greater the emf produced. However, the number of turns had to be limited to decrease the inertia of the rotating solenoid.

Motor

The motor can be related to the generator in that it performs the same function, but in reverse. The voltage produced by the generator is connected in series with the solenoid. The AC voltage creates an emf, which causes the solenoid to spin inside the magnetic field. Hence, motion of the conductor, which spins the blades of the fan on top. Great care needed to be taken in not putting too much weight on the fan of the motor. Furthermore, friction had to be taken into account as a force opposing the rotation of the fan motor.

Inertia

Although a considerably large number of turns would be required, in addition to a strong, uniform magnetic field, the number of turns of the solenoid needed not severely increase the rotational inertia of the system. However, this was mostly not a problem in this experiment, because the wind power produced by the first fan was sufficiently powerful to turn the armature.

$$I=(1/2)m\omega^2$$

Friction

Friction is the greatest contributor to error in this experiment. If the system were ideal insomuch as that friction did not decrease the efficiency of the motor, then it would operate at 100% proficiency, of course. To help this problem, very slippery wheels were used to hold the solenoids in place, allowing them to rotate almost completely freely.

Results

The task at hand was successfully fulfilled, when a voltage of

$$130\text{ mV}$$

was produced and used to bring about rotation of the motor, very slowly.

Efficiency

The results of the experiment determined that wind power is not very efficient.

Sources

1. DC Electronics Book (Used for PHYS 220V)
2. www.otherpower.com
3. www.alternative-energy-news.info