

Making and Testing Electromagnets

Electricity All Around Us Backgrounder



Electromagnet: uses electricity to create a magnetic field. All electrical currents create magnetic fields but a regular current is not strong enough to be used. A stronger field is made when an insulated wire is wrapped around an iron core (like a nail) and a current is passed through the wire. The strength of the electromagnet depends on the number of times the wire is wrapped around the metal object.

Electromagnets are used in junk yards to pick up scrap metal and are used in electric generators, electric motors, doorbells, circuit breakers and televisions.

Electromagnets are found in a great number of appliances in the home and school. They are the basis of all electric motors. They are also important in electrically-operated switches called relays. These are found in automobile starters, computers and many other places. Essentially, an electromagnet is simply a coil of wire wrapped around a ferrous material such as iron. Current moving through the wire induces a strong magnetic field that is concentrated in the metal core. The current causes the electrons in the metal core to spin or turn with all their axes lined up parallel to the lines of magnetic force in the field. Any material where this effect can be induced can be turned into a magnet.

By switching the direction of the flow of electrons in the coil (reversing the connections to the battery). You can cause the magnet to reverse its polarity (batteries and magnets have two poles: positive and negative. Only opposite poles will attract, or allow energy to pass freely). This effect is used to great advantage in electric

motors, where a commutator allows this polarity switching to occur. The electromagnets mounted on the rotating shaft of a motor are at first attracted to the field magnets and are pulled towards them. As they pass, the polarity reverses, and the electromagnets begin to repel the field magnets. The result is rapid rotation of the motors shaft.

Electromagnets are also important in audio speakers/ A "voice coil" made of fine enamelled wire similar to the wire used in this activity is glued to a diaphragm made of paper, plastic, foam, or some other light, thin material. A permanent magnet is located near the coil in such a way that when small electric currents are fed through the coil, the coil and the electromagnet interact, causing the diaphragm, to vibrate to generate sound.

An example of the electromagnet you will be creating in this activity:



