

Electromagnets

The Physics of an Electromagnet

An electric current flowing through a wire always produces a magnetic field. Remember, a magnetic field is the area around a magnet that is affected by the magnetic force and can only be produced by moving charges.

So, if you get some copper wire and coil it up, and connect its ends to a small battery, you can make a weak electromagnet! To make an even stronger electromagnet, coil your copper wire around a large iron nail. The nail is induced to become a magnet (magnetic induction), and makes the whole thing stronger.

How does this happen?

The atoms inside of a magnet all line up the same way. In things that are not magnets, the atoms don't line up. When the copper wire is coiled around an iron nail and attached to a battery, the atoms in the nail start to line up, too. Now the nail is also a magnet!

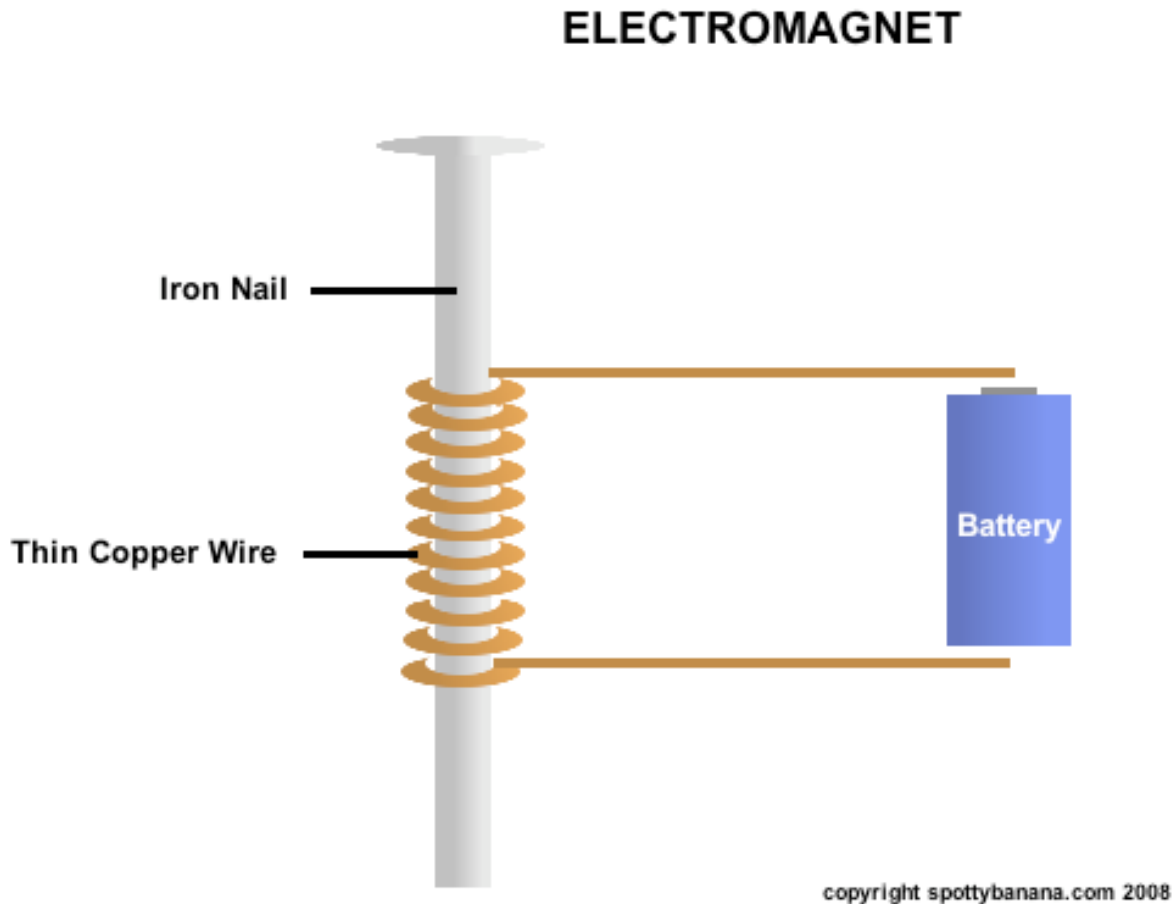
Building an Electromagnet

Materials (most can be found at your local hardware store)

1. Large iron Nail
2. Roughly 3 feet of thin copper wire
3. 9 V battery
4. Paperclips

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Diagram



Procedure

1. Wrap the copper wire around the nail making sure to leave at least 6 inches at each end for a lead that will be taped to the battery.
2. Direct the point of the nail toward your paperclips.

Q. What happens when you disconnect the battery? Why?

A. The nail no longer attracts the paperclips. Remember, magnetic fields are only produced by moving charges. When the battery is disconnected, the charges stop moving through the copper wire (current), so the magnetic field disappears.

References

Keller, Dr. R.W.. Real Science 4 Kids Physics Level I. Albuquerque: Gravitas Publications, Inc., 2005.

"Electromagnet." Wikipedia. 2008. 8 Feb 2008 <<http://en.wikipedia.org/wiki/Electromagnet>>.