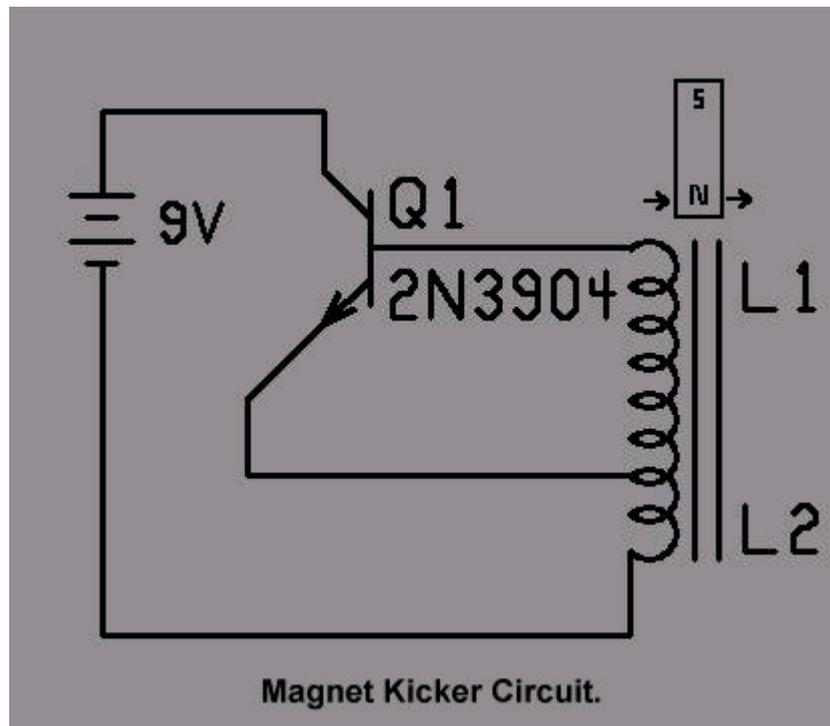
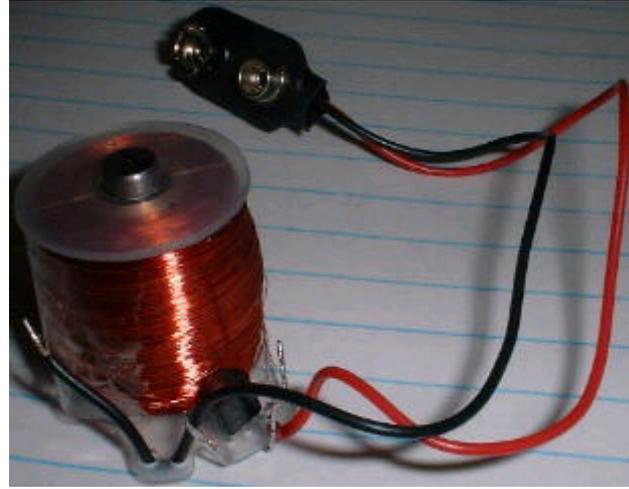


Magnet Motor - Kicker.



Have you ever wondered how those magnetic motion toys work. The picture above shows one and what is inside it. The circuit is very simple. It consists of a coil around an iron core, an NPN transistor and a 9volt battery. That is it! No resistors, no capacitors; just the coil, transistor and battery.

The coil is in two parts. An inner coil to drive the moving magnet and an outer pickup coil with many many turns to sense the moving magnet and generate enough voltage to momentarily turn on the transistor. The two coils are wound as though they are one with a tap near one end. In other words, a single coil with a tap near one end would be phased properly when connected as shown in the diagram.

With no moving magnet near the coil, the transistor is biased completely off (small resistance of coil from base to minus) and no battery current is drawn. When a magnet moves near the coil, it generates a voltage pulse that turns on the transistor and pulls battery current through the low end of the coil. This energizes the core, enhances the drive pulse to the transistor base, and produces a momentary magnetic kick to enhance the movement of the magnet. The circuit only draws current from the battery during this short kick pulse.

The driver coil that is driven by the transistor can be seen as a lighter color near the core. It is wound of a larger diameter wire in order to carry a larger current supplied by the transistor. The outer pickup part of the coil is of very fine wire for many turns. The more turns, the more sensitive the circuit will be to a moving magnet. I estimated about 2500 turns on the inner coil and 8,000 to 10,000 turns on the pickup coil. The driver coil wire measured to be about 5.5 mil thick and the pickup coil wire measured to be about 3.5 mil thick. These measurements included the insulation enamel on the wire.

The polarity of the approaching magnet determines whether this kick happens while the magnet is approaching or while the magnet is leaving the core.

I was able to make my own magnet kicker motor by winding a tapped coil on an iron bolt. For simplicity, I used just one small wire size and wound it as shown (picture to come, check back later). I used some 3.5 mil wire that was handy. The transistor was an NPN 2N3904, but just about any bipolar transistor will work. I have also seen this circuit made with a PNP transistor.

I made an armature by simply gluing two disk magnets on to a piece of thin music wire with hot glue. I could make it run like a motor by loosely holding it and giving it a spin near the coil. The two magnets were glued on to the music wire in such a way as to simulate a shaft passing through the middle of a bar magnet. The poles face 90 degrees from the music wire shaft so that one side of the armature is North and the other side is South.

[Spark, Bang, Buzz and Other Good Stuff. Home page.](#)