Coil Winder

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Practically all metal detectors employ a search head containing one or more coils. If you build a metal detector, winding one or two relatively small coils is not difficult. This is typically done by making a circular pattern of nails on a piece of plywood and winding the wire around the nails. But if you want several coils for your design, or the coils involve hundreds of windings, then you will want a more flexible and faster method. The coil winder described here is simple to make, uses easily available material, and can wind coils of almost any size or number of windings.

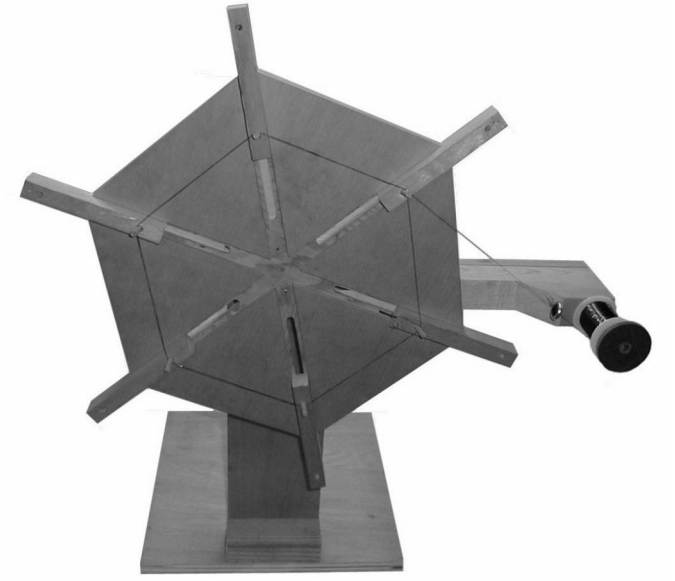

FIGURE 1. Completed coil winder

Figure 1 shows the coil winder completed. It consists of a spoke disk, adjustable spokes, wire spool arm, and mechanical counter. The counter is the most difficult item to find. Mine is a heavy brass unit off of some long-forgotten machine; surplus houses are a good place to look for these, and several can be found on the internet. The remaining material is available from the local home improvement center or your scrap pile. I've intentionally neglected to give dimensions for most of the pieces of this project because it was built largely with scrap material, with no particular effort made to size the pieces.

The spoke disk is a hexagon having a width (flat-to-flat) of 16". This can be cut out a number of ways, with a table saw probably being the best. Next, slots must be cut in the disk for the spokes to slide in. These are 3/4" wide and about 3/8" deep and may be cut with a router or a table saw with dado blade. Finally, each slot section must have an additional narrow slot cut completely though the disk for the bolts. This task is best accomplished using a router with a 1/4" plunge bit and a 3/8" bushing guide. Plunge the router bit all the way through the disk (make sure the disk is on blocks) and let the bushing ride along the inside wall of the 3/4" slot. Run the router along both walls of the slot so the resulting bolt slot is perfectly centered. Also, don't cut the bolt slot too long; stop about 1-1/2" from the corners and about 2" from the center. Clean and smooth the slots with sandpaper. Figure 2 is a close-up of the completed disk.

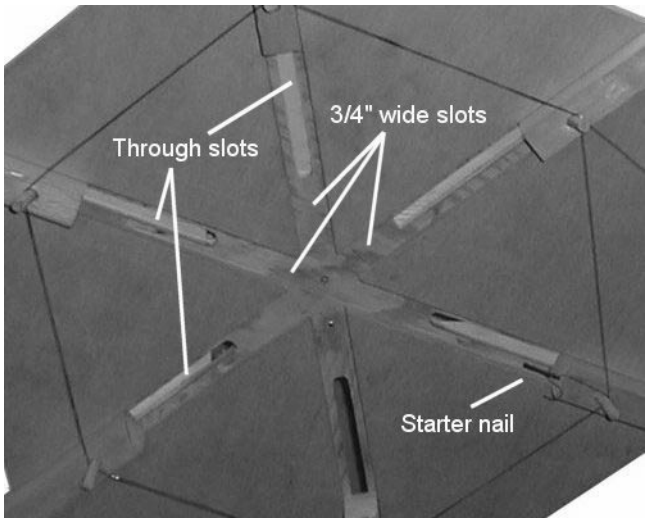

FIGURE 2. Disk

The spokes are made from 3/4"x1" wood cut to about 6" long. They should fit snugly into the 3/4" disk slots but should slide with fair ease. Trim, sand, and wax the spokes until they slide easily. On one 3/4" face of the spokes drill a 3/8" hole about 1/2" deep at a distance of 4" from one end. Screw the brass threaded inserts into these holes. On the opposite 3/4" face of the spokes drill a 1/4" hole about 1/2" deep at a distance of 1/2" from the end, but angle this hole about 20° toward the end of the spoke. Drill a second angled hole 5-1/4" away from the same end, at the same angle. Sand the faces of the spokes to remove any roughness. Figure 3 shows a drawing of the spoke.

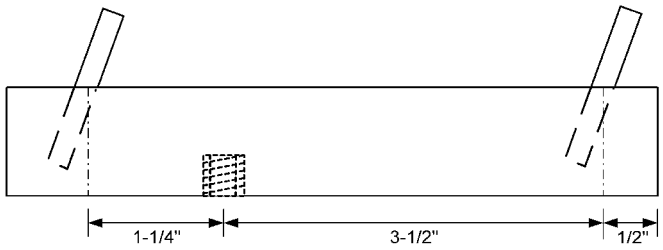

FIGURE 3. Spoke

The spoke disk is mounted on a base frame which includes an arm for holding the wire spool, shown in Figure 4. The base frame consists of a bottom piece and an upright joined with a cleat. These can be any practical dimensions but the upright needs to be tall enough to accomodate the disk with the spokes fully extended. In Figure 1 (spokes extended) you can see that I've made the base taller than necessary (20" total height) to accomodate longer spokes in the future. At the top of the upright is an additional piece of wood for added thickness for supporting the disk axle. A horizontal hole is drilled through the assembly to accept the axle shaft of the spoke disk.

FIGURE 4. Base Frame

FIGURE 6. Handle & Counter

Figure 5 shows a top view of the spool arm. It is basically a length of 1x2, long enough to extend past fully extended spokes, with an offset block attached. The offset block sets the position of the spool just to the front of the spokes. It a good idea to complete all of the other assembly before cutting this piece as its required thickness will depend on how other things are done. A 1/2" hole is drilled near the end of the offset block to accept a 3/8"x4" cast iron nipple. The wire spool is slid onto this, and a retainer can then be threaded onto the end of the pipe. For this, I used a round piece of masonite. Finally, an "eye" screw is screwed into the offset block near the spool holder, making sure it is far enough away to accomodate the largest spool size, with a hard rubber grommet pressed into the middle to keep the guide from damaging the wire varnish. Again, the exact position of the wire guide will depend on where the wire spokes end up.

The spoked disk has an axle shaft which extends through the top part of the base frame and has a turning handle on the other side. Figure 6 shows the final assembly along with the counter. The axle and handle are pieced together from 3/8" cast iron plumbing, with a 1/2" PVC sleeve as a hand grip. The axle is mounted to the spoke disk with a flange as shown in Figure 7; in my case, I used a 1/2" flange with a 1/2"x3/8" bushing. Washers are used to shim the assembly as it is being put together to minimize longitudinal play.

The final component of the coil winder is the counter. This is needed if you want to wind more than a few tens of turns, and is the part of the project where you may need to be creative. The counter I used is a heavy brass type with a lever arm that increments the counter when the arm is depressed. I mounted the counter in a convenient place and added a hose clamp to the winding handle with the excess band hanging out. Every time the handle rotates around, the hose clamp band flips up the counter arm and increments the counter.

Once the entire coil winder is assembled and adjusted, you will need to drive a small nail into the inside end of one of the spokes to hold the end of the wire (see Fig. 2). The best spoke to chose for this is the one closest to the spool arm when the counter is about to be tripped. Set the spoke pegs to the inside holes for small coils, and the outside holes for large coils. With the pegs set, adjust the spokes to get the desired coil size, wrap a few turns on the nail, and wind away.

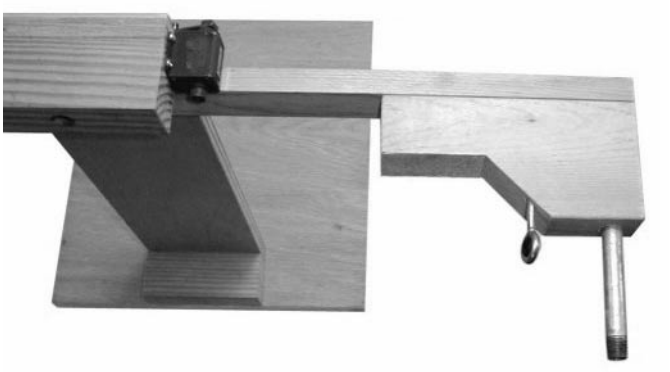

FIGURE 5. Spool Arm

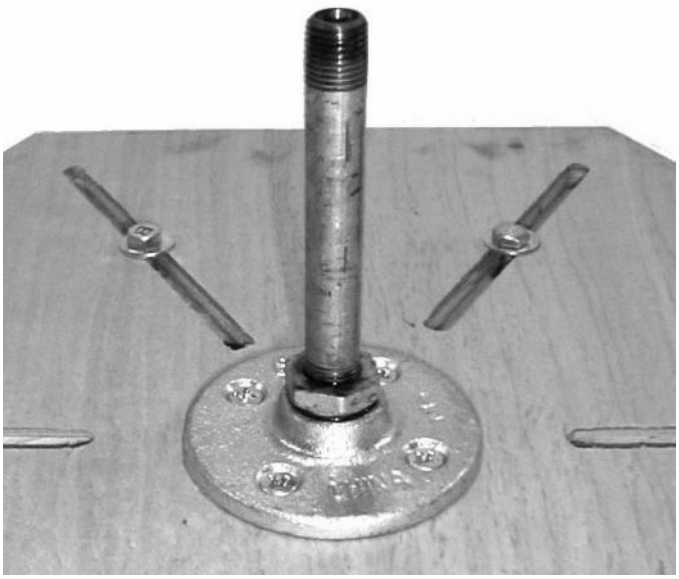

FIGURE 7. Flange Detail