Building Coil Enclosures

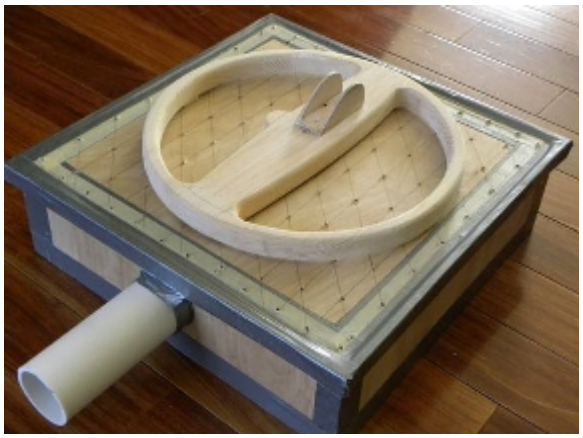
This document is intended to show how to create quality coil enclosures to house your custom wound coils. So now that you have your metal detector circuit and coils working on a table, what are you going to do with it? ***Finish it!***

Here are a couple of examples on what you can do with a little effort:

Below are a few things you will need to create professional looking coil enclosures.

1. A vacuum table. Any ridged "box" of adequate size will do. I made mine out of 1/2" plywood. It may take you an evening to assemble one, but it's worth it, and you can now make MANY coil enclosures! Just make sure that it's large enough.

My setup looks like this:



2. A coil former. You can use 1/2" pine or plywood. Simply draw out a pattern and cut it out with a jig saw, then sand. It is HIGHLY recommended to coat your former with Epoxy, or it will warp when hot plastic touches it!
3. A shop vacuum
4. Epoxy – about 350 ml for a 10" coil. Stay clear of "fast" setting epoxies as they tend to dry somewhat flexible and shrink more. Here is my favorite, from Mouser electronics:

http://www.mouser.com/ProductDetail/MG-Chemicals/832B-375ML/?qs=sGAEpiMZZMvcAs5GUBtMdf5xlKQhWcq2

5. Vacuum forming plastic sheets: I have had success with 1/16" (.060) styrene sheets from "Micromark":
6. http://www.micromark.com/Plastic.html

Or

http://www.widgetworksunlimited.com/Thermoform_Plastic_Sheets_s/36.htm

They come out to be around $6.00/sheet

You must build a frame to support your plastic sheets while forming. Mine has 2 sides with screws holding the two halves together with the plastic sheet help firmly in the middle.

7. Cable – Type will depend upon what your project specifies. I use a USB – 2 cable for my TGSL coils

8. Strain relief: Can be ordered from http://www.heyco.com/products/sec_02/ltf.html
   3237 is the correct size for a USB 2 cable

9. Kitchen oven.

10. Gloves

Forming Coil Shells

Now for the tricky part. Preheat oven to 400° . Place your frame and plastic sheet in the oven and monitor closely – Total time in the oven should not exceed 3 minutes at this temperature. (Most ABS or Styrene plastics have a working temperature of around 325 – 350 degrees.) When the plastic sheets begin to "sag" in the middle by about 3" QUICKLY turn on your shop vacuum and apply the plastic frame over your former, making sure that you have a good seal around the edges. *You may have to coax a few areas into corners* but with a little practice, you will find out that it's not that difficult. Note:

Unless you have a vacuum table with a LOT of pull, you can compromise by getting the plastic hot, almost to its melting point. If you cannot get the plastic to form, it's not hot enough. A little trial and error may be required.

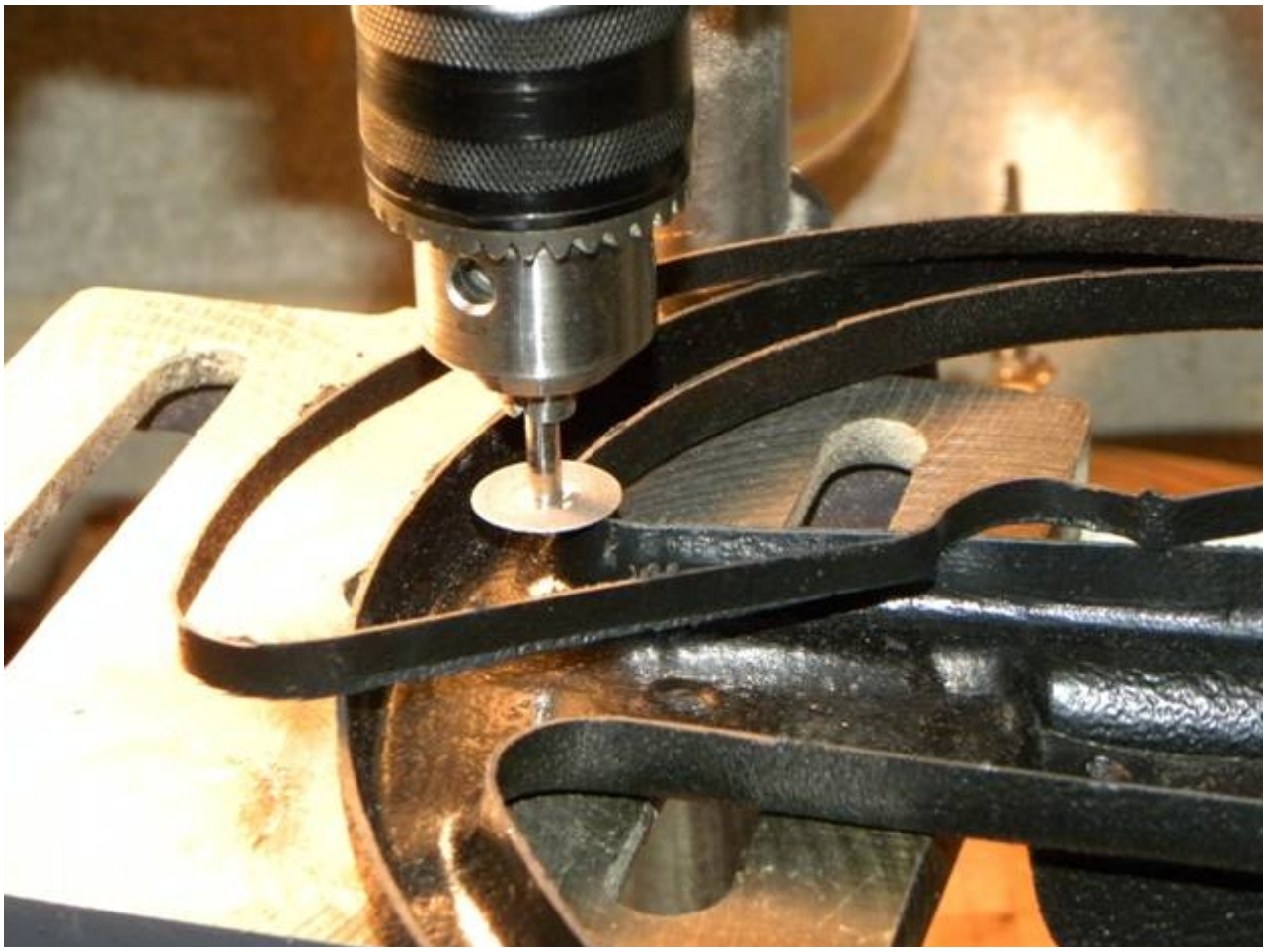
Warning! Use gloves! Plastic is HOT and can seriously burn you. Be careful when reaching in the oven.

Carefully remove your plastic sheet from the wooden form (can be a little tricky). I generally trim to a rough shape using a pair of scissors and box cutter.

Now, your coil shell must be trimmed to its final thickness. I'm sure that there are several ways to do this including band saws and hot wires (which I have not tried).

I use a drill press with a Dremel mandrel and small cutting wheel. Just rotate the coil shell around to trim. For a TGSL coil shell, I can get away with a total thickness of 13mm or ½ inch. If you use the right epoxy, you can get away with making your coils very thin and rigid.

Cutting the shell.



Find out how much Epoxy you need. Fill the finished shell with water to get an idea of what its volume is. Mine came out to be something less than 350ml

Next, install your strain relief, cable and coils. I find that USB-2 cables work well for TGSL coils.

Install coils. Keep connections short and neat. You can use a small tie wrap as a strain relief. Then, time for final null and balancing. I generally glue everything in the shell with Superglue to keep things in place before filling with epoxy.

Time for epoxy. **Stay away from fast cure epoxies. They can harden flexible and shrink excessively! Also, quick setting epoxies can get very hot when curing and will likely melt your shell!!!**

Just place your coil level, mix your epoxy and fill shell to just under the rim. It's better to use sparingly as too much epoxy in the shell can run over and make a real mess.

Next, drill your hole for the clevis on your rod. BE CAREFUL! It is very tricky. Start with a small bit

and work you way up. Drill bits have a way of destroying plastic and epoxy in a heartbeat!

Measure twice.. Drill once.. It's easy to make the hole crooked and ruin a nice looking project.

Results:

Pictured above are a few "Good" ones..

Good Luck!
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