

## Pickup Winding Technique

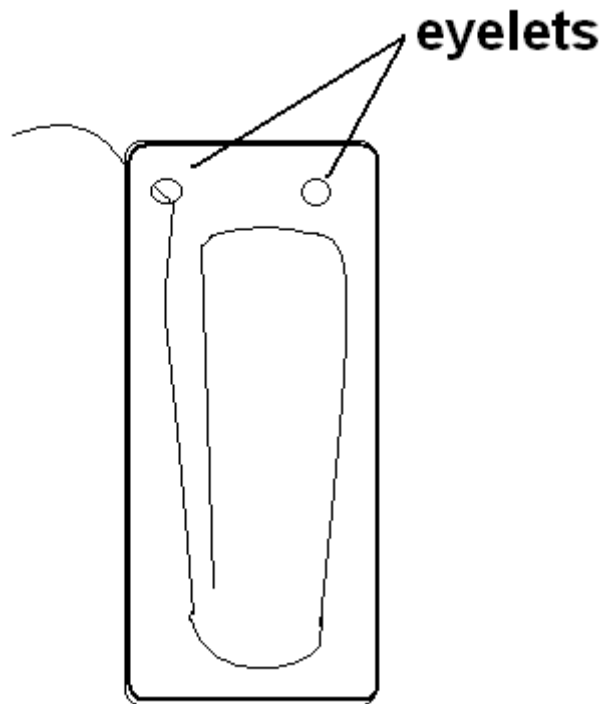
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I have developed a method to wind pickups using a simple motorized winding machine and an axle to hold the spool of wire in place while it rotates. This method is crude, but it has produced several high quality neck/bridge pairs of P90 style pickups.

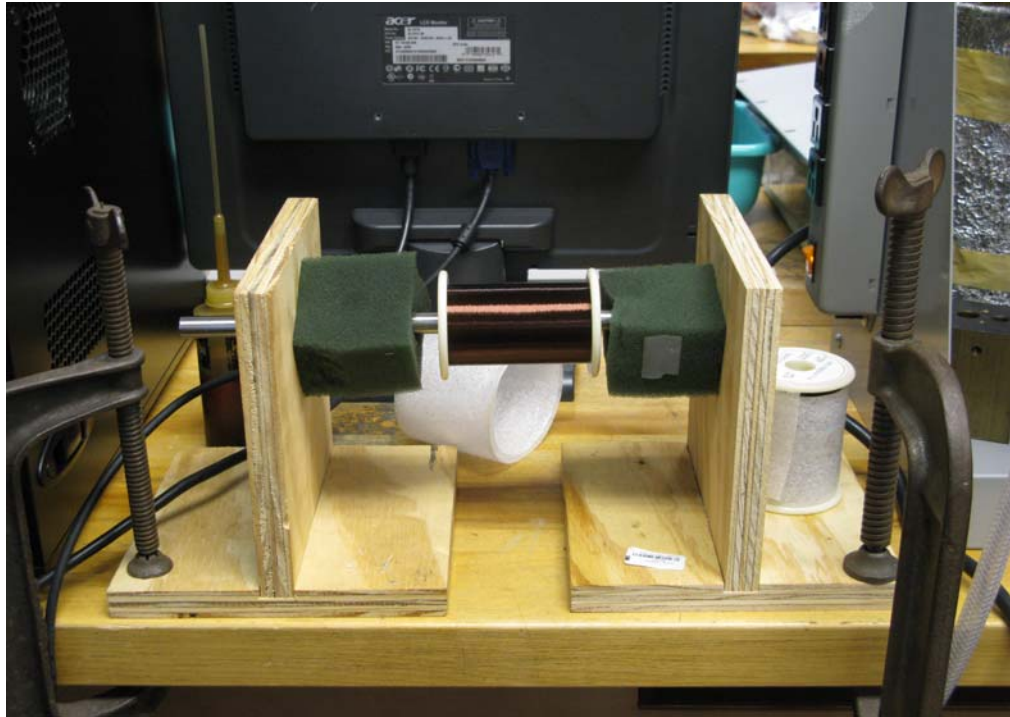
Before winding pickups, two holes should be made at one end of the bottom side of bobbin, one for the start and one for the end of the pickup wire. P90 style bobbins (which can be purchased at [mojotone.com](http://mojotone.com)) already have these holes. Next, an appropriately sized metal eyelet needs to be placed into each hole. This is where the connections to the “hot” and ground wires will be made.

When winding pairs of pickups (i.e., bridge/neck combinations), it is important to make sure they are reverse wound to have a hum cancelling effect. That is, the bridge pickup should be wound in the opposite direction as the neck pickup. In addition, approximately 6 inches of wire should be taped down to the bottom side of the pickup from the “start” eyelet so that it can be soldered to the eyelet later on. Make sure that this part of the wire will not get in the way during winding. Either eyelet can be chosen to be the “start”, just make sure that both the neck and bridge pickups use the SAME hole as the start. See Figure 1.



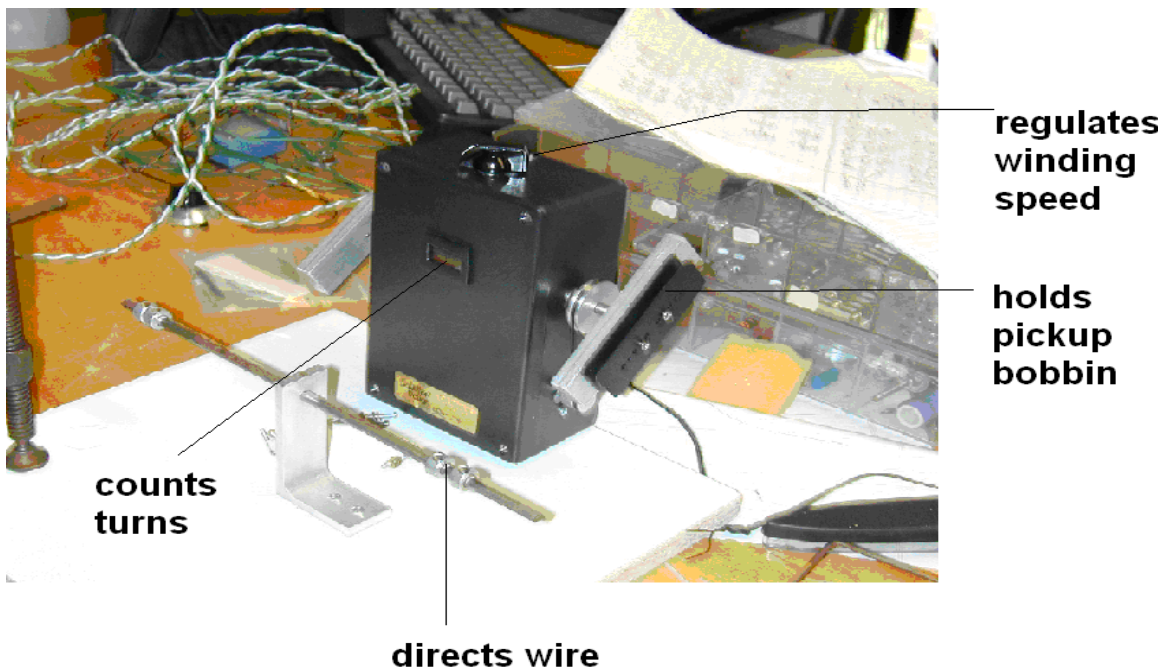
**Figure 1.** Pickup bobbin ready to wind, viewed from the bottom. One end of the wire is taped down to the outside of the bobbin, and the other end is attached to the spool of wire.

The spool of wire should be placed onto an axle so it can rotate as the wire unravels. This can be done in many ways, but it is important to have the spool rotate with minimal friction because pickup wire is very thin and breaks easily. I used a metal rod for the axle, and used oil before each winding to minimize friction (Figure 2).



**Figure 2.** Axle supported by wooden boards which are clamped to the lab table.

The winding machine should be placed approximately 3 feet from the spool of wire, roughly at the same height. In the UIUC Physics of Music lab in ESB, this can be done by clamping the winding machine on a neighboring lab table, across from the spool of wire. The bobbin can be screwed onto the winding machine to hold it in place. (Figure 3) For the neck pickup, screw the bobbin onto the winding machine in with the eyelets towards the winding machine. For the bridge pickup, screw the bobbin on with the eyelets facing away from the winding machine. This way, pairs of pickups will be reverse wound.



**Figure 3.** Winding machine. Pickup winder. The wire is pulled off the spool and held down (by hand) on the metal bar and fed into the rotating bobbin.

Once the bobbin is screwed in and the spool is on the axle, the pickup is ready to be wound. Before winding, there are a few things that should be taken into consideration. During winding, there should always be enough tension on the wire so that there is no slack in the wire in the pickup coil. If there is insufficient tension during winding, loose parts of the coil will be folded over as more wire is wrapped on top of these loose areas. It is especially important to make sure there is sufficient tension at the start (i.e., the first 1000 turns or so). It is also important to make sure the pickup is “scatter-wound”. If the coil is wound uniformly, the capacitance of the coil will be maximized. Slowly move the wire from side to side as it is fed into the bobbin to scatter wind the pickup.

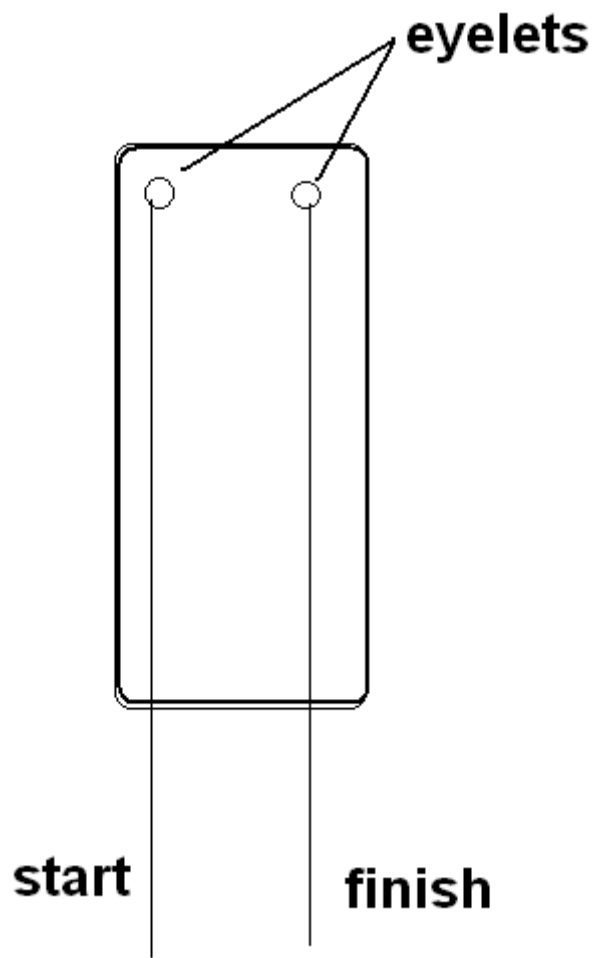
In order to regulate the tension, place the wire on top of the metal bar in front of the winding machine, in between the two metal spacers. Press down on the wire from the top using your index finger to increase the tension. Keep this finger in place at all times when the pickup is being wound. Use the groove in your index finger to direct the wire, as shown in Figure 4. Make sure not to bump into the wire as it is fed off the spool.



**Figure 4.** Finger placement.

Use your free hand to regulate the winding speed using the knob on top of the winding machine. The combined tension provided by the rotating spool and the friction from your finger should be sufficient to wind the pickup. However, you can provide additional tension using your free hand by lightly pinching the wire. It will typically take approximately 1 hour to complete the winding (for ~10,000 turns). The winding machine counts the number of turns, and displays this number on the front. Be sure to keep close track of the number of turns, especially near the end of the winding. The speed should be slowly decreased at the end, so that there are no abrupt changes in tension. Start decreasing the winding speed when there are about 200 turns left.

Once the pickup has been wound, take it off the winding machine and cut the wire leading from the spool to the bobbin. Put this end through the “finish” eyelet and tape it to the outside of the bobbin, as shown in Figure 5.



**Figure 5.** Completely wound pickup as viewed from the bottom.