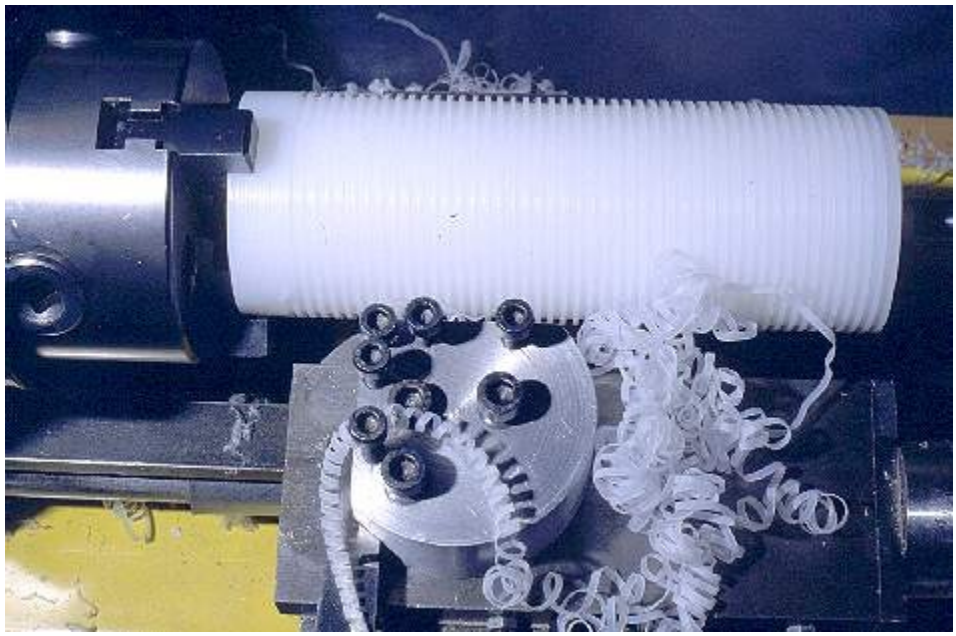
Mechanical construction

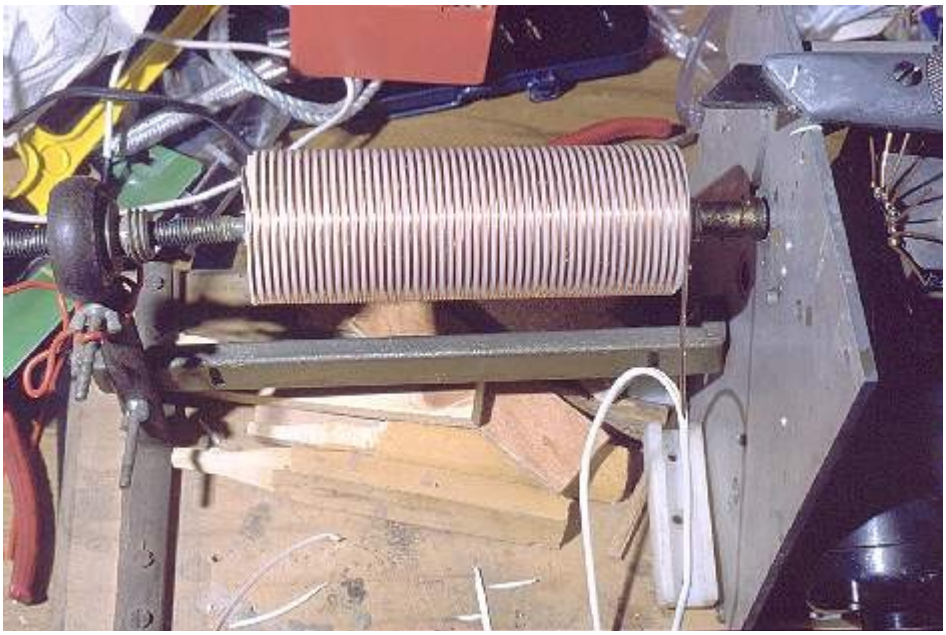
The lathe I used is a small German-made desktop unit intended for hobby use, that can turn pieces up to 75mm diameter and about 250mm length. I bought this lathe with the specific idea of finally being able to build a good mobile antenna, and other radio-related mechanics! I learned the basics of tooling operations while building this antenna.

The loading coil:



There are several advantages to winding the loading coil *inside* the support tube: It will be protected from the weather and dirt, it will look clean, and it will allow all of the tuning mechanisms to use the room inside while contacting the wire. So I had to come up with a way of making such a coil! And it needs to be quite precise, because the wheels of the chariot must be able to freely run on the coil turns, without ever causing a short between two turns!

I first made a winding core from inexpensive, soft polyethylene (PE). This core has a diameter of 55mm, which is 2mm less than the internal diameter of the coil tube. The core is slightly longer than the coil tube; the exact length is not critical. Into this core I cut a thread, which has a pitch of 3mm per turn, while the cross section is rectangular. The width of the cut is 0.1mm more than the wire diameter, so that the wire can move freely in the thread, and the depth is equivalent to the wire diameter.



Then I wound the coil on this core. I used a winding machine I got from CE5FSB, back in my university times, but hand winding could also have been used. The wire is the kind used for electrical installations in homes. It's solid copper wire of 2.5mm² cross sectional area, insulated in PVC. I removed the insulation while winding, by slitting it open with a sharp knife. It's good to avoid touching the bare wire, because the skin oils would later weaken the bond with the glue used to mount the coil in the tube.

The wire ends are fixed to the core using two screws installed in the two ends of the core.

After machining the coil tube, making its two threads, the coil has to be installed inside. This is done with slow-setting epoxy glue (I used 90-minute Araldite), in this way: Firstly, the tube is sanded on the inside, using coarse sandpaper, in order to improve adhesion of the epoxy glue. A layer of epoxy is applied to the inside of the tube. This layer should be 0.2mm thick. If it's thinner, the structure will end up weaker, and if it's much thicker, the epoxy will hinder the free motion of the chariot wheels. I made a spatula of plastic scraps, which has the blade cut to the exact radius of the glue layer (28.3mm), and covers about 90 degrees of the tube. This spatula has two little holes at the corners, in which I anchored small pieces of 0.2mm magnet wire. These serve as spacers between the spatula and the tube, making it very easy to apply the required even layer of glue.

Then four pieces of 1mm magnet wire were inserted into the tube at 90 degrees from each other, and bent over the ends of the tube. These four wires serve as spacers, allowing to slide the core with the coil into the tube, without touching the glue! Now, from each end of the assembly, 4 small pieces of spacing wire are inserted. These wires keep the core and coil centered while the long spacing wires are pulled out.

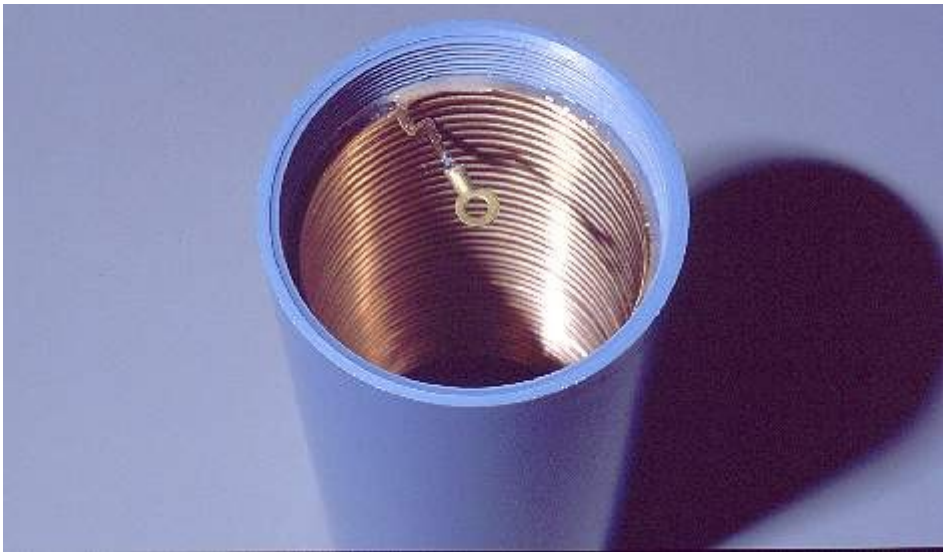
The anchorings of the coil wire at the ends of the core are now removed, and the wire is cut off cleanly, so that it can retreat in the thread of the core. If all is correct, the coil will spring open and contact the glue, while being held at the precise pitch by the edges of the rectangular thread of the core! The low friction of PE helps making this step easy! In any case, you can help by pushing the coil wire ends in. It's important that the coil springs open to the full inner diameter of the tube, because otherwise the chariot may jam later.

During this procedure of settling the coil against the tube, the short spacer wires are kept in position by adhesive tape or other means. It's very important to keep the core well centered at all times, because otherwise it may bind to the glue. While PE does not adhere well to epoxy glue, you may still manage to get enough glue on it to cause trouble, so be careful!

After the coil has fully expanded, the glue should be allowed to set while the assembly is constantly rotating. This is necessary in order to avoid the risk of having the glue flow down by gravity, causing an uneven layer and later trouble. As shown in this photo, I used the winding machine at low speed, and directed the beam of an infrared lamp on the coil tube, in order to speed up the setting of the glue.

Excuse me for the messy photo. I surely may win some "messy shack contest"!

When the glue has fully set, it's time to remove the core. This is the

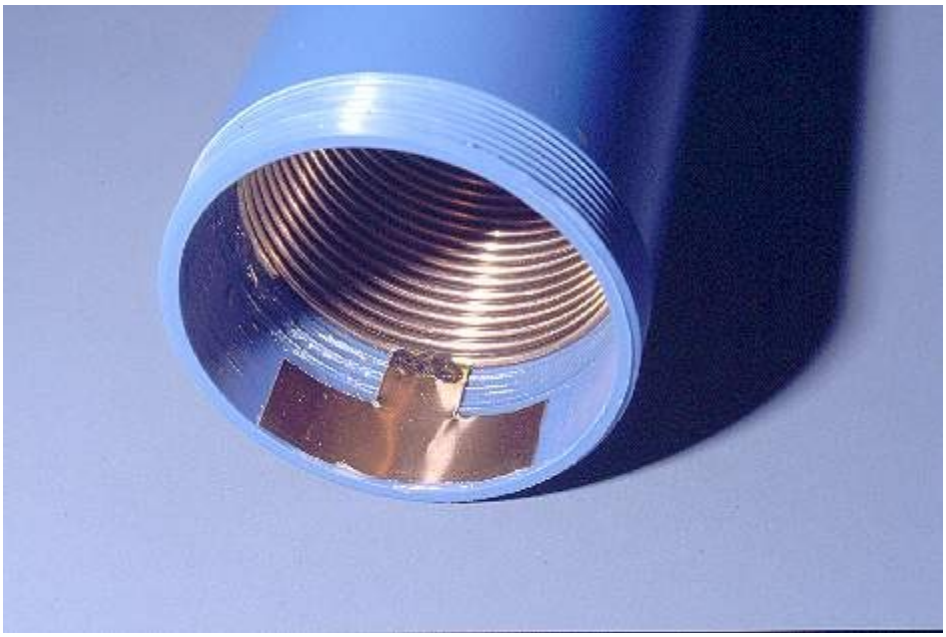


moment when it's most important that the core was made from slippery PE, and that the thread was wide enough: Because the core must be literally screwed out of the coil! I clamped the core end in a vise and turned the coil tube with both hands.

After the core has come out, you can inspect your coil. Wow! Mine came out looking much better than I had expected!

This photo shows the top end of the loading coil. Any excess wire is removed, then the last quarter turn of wire is reinforced with additional epoxy on the top side (no wheel will travel here), the wire end is bent to fit the plan, and a solder lug is installed. The lug must be centered, and flush with the end of the tube.

Likewise, the lower end of the coil is cut to the dimension given in the plan, and then reinforced with a dab of glue. A contact plate made from 0.1mm copper sheet is soldered to the last turn of the coil and epoxied to the tube. If part of a turn remains unused, that's no problem, but make sure that the coil has the full dimension (amount of turns) shown in the plan! Even one missing turn would cut off a large part from the 40 meter band!



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