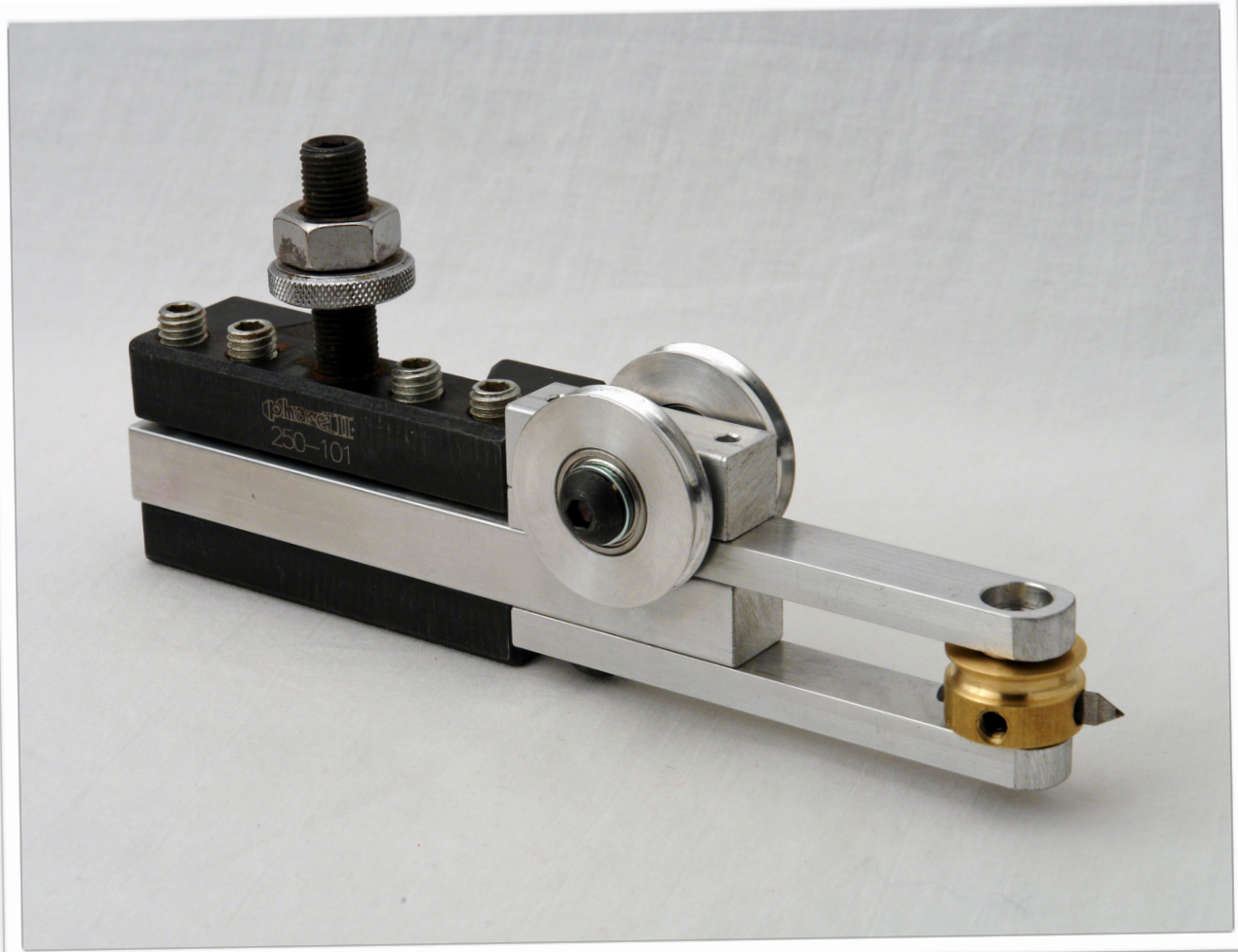


Horizontal Cutting Frame

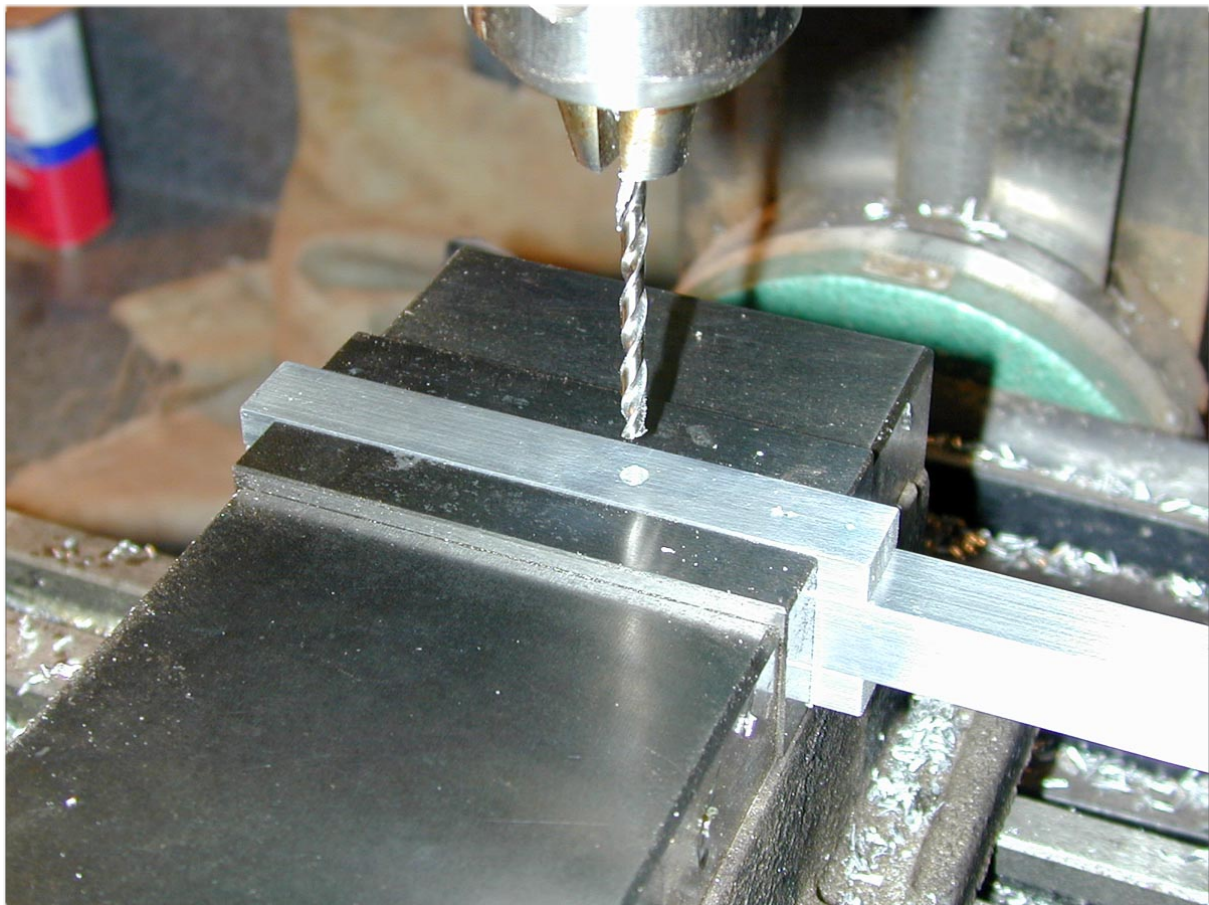


This article describes the construction of a Horizontal Cutting Frame (HCF) for ornamental turning. A mini metal lathe and a mini milling machine (or at least a very good drill press) are required to make this project.

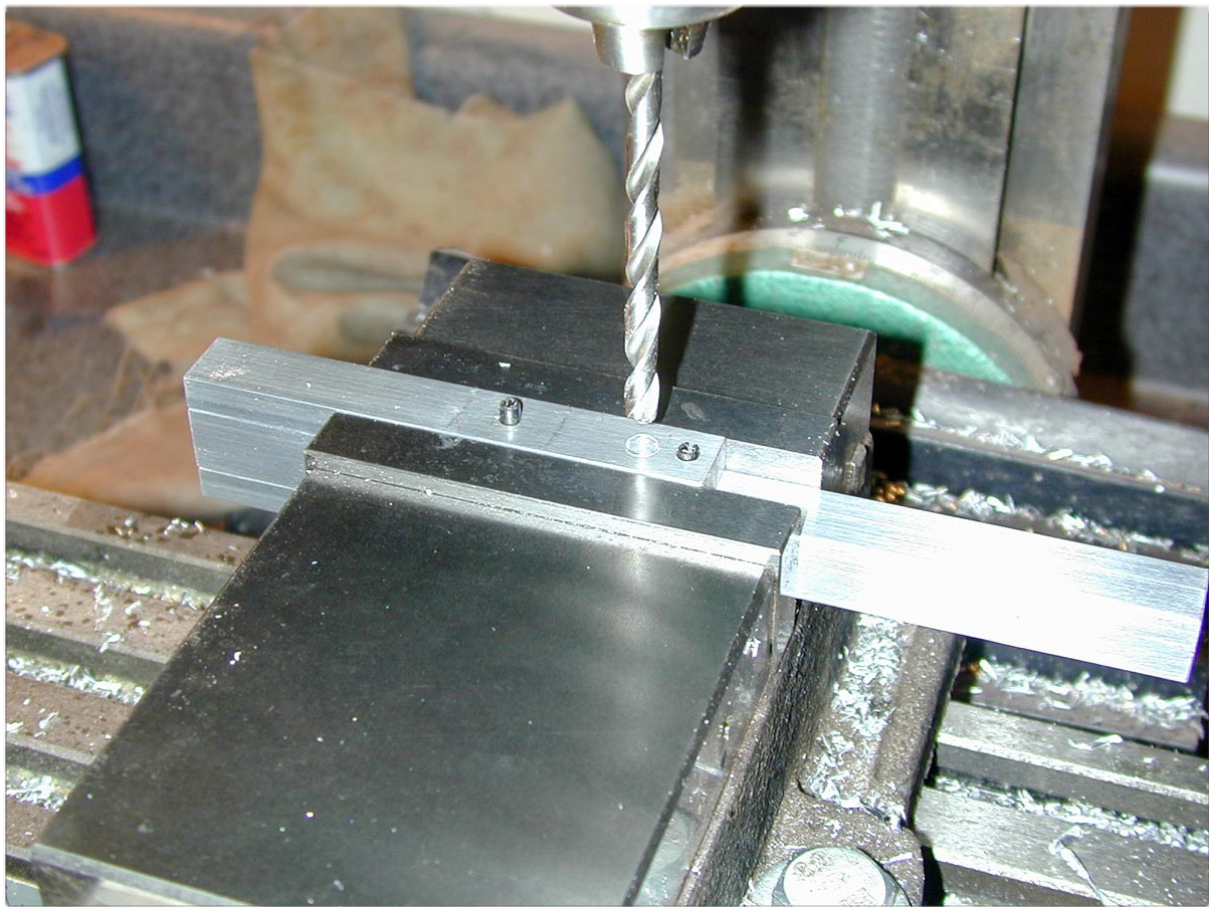
I started with the main frame, using 6061 Aluminum ($1/2"$ x $1/2"$ bar and $1/4"$ x $1/2"$ bar). Cut the top and bottom arms to length, and the $1/2"$ x $1/2"$ top cap. In the case of the $1/2"$ x $1/2"$ center bar, leave it the full length of the arms (total of 6.5") so that it can provide

support when drilling and reaming the bearing holes. The 4 frame pieces are held together with two 1/8" spring pins (to assure an accurate alignment) and a 1/4-20 x 1.5" screw.

Align all 4 of the frame pieces in a vise and drill the first spring pin hole. The pins I had were too tight in a 1/8" hole, so I used a #30 drill. Press the first pin into the 4 pieces with an arbor press.

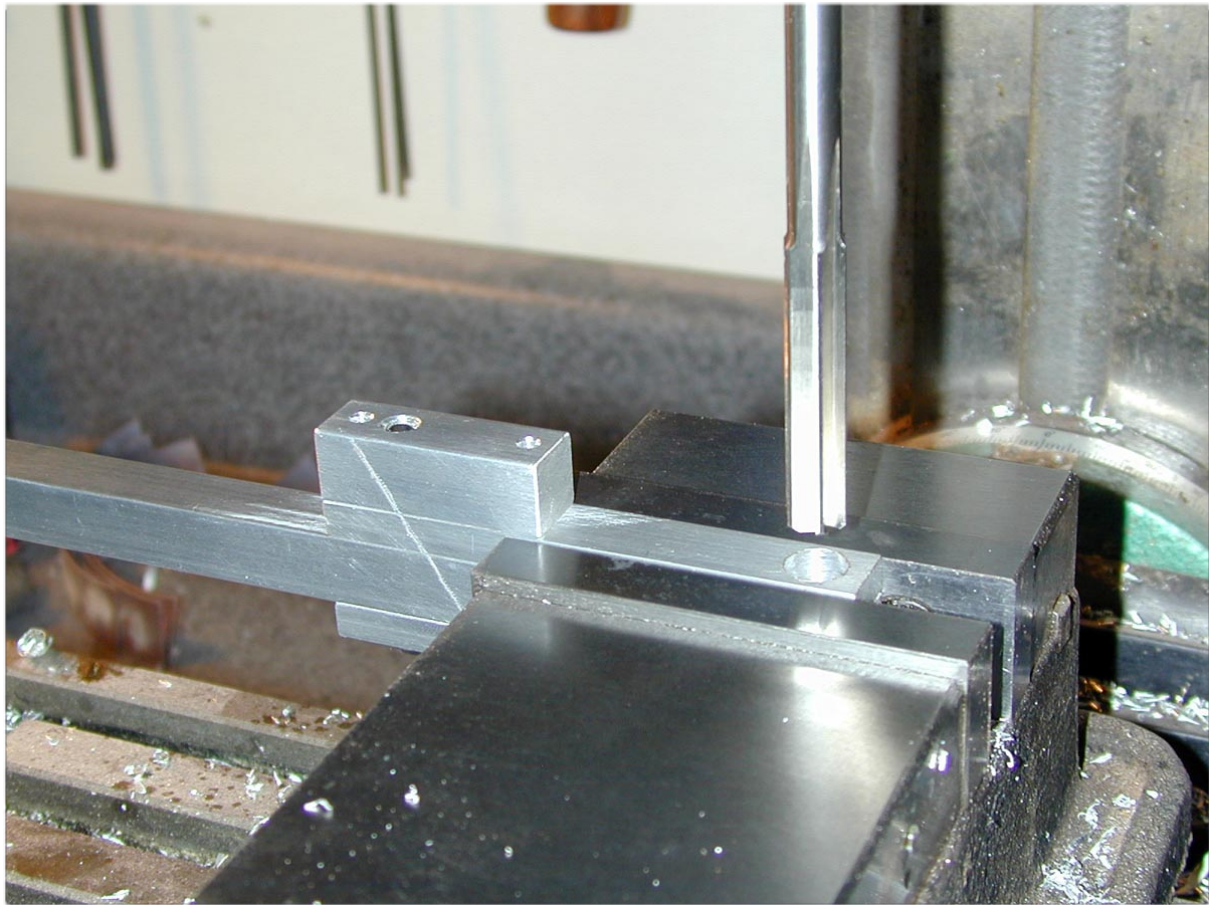


Next, drill the hole for the second pin and press it in place. Then drill the hole for the screw through all 4 pieces (#7 drill for tapping). The only piece that is actually tapped is the top cap, so I removed the top cap and then enlarged the hole in the remaining 3 pieces with a 1/4" drill. Be sure to mark the pieces so that you can re-assemble them all in the proper orientation.



Tap the hole in the cap piece and reassemble the stack together with a 1/4-20 screw.

Now its time to drill the hole at the end of the arms for the bearings. Drill through all 3 pieces with a slightly undersized drill ("U" drill). Then ream the hole with a 0.3755" reamer.

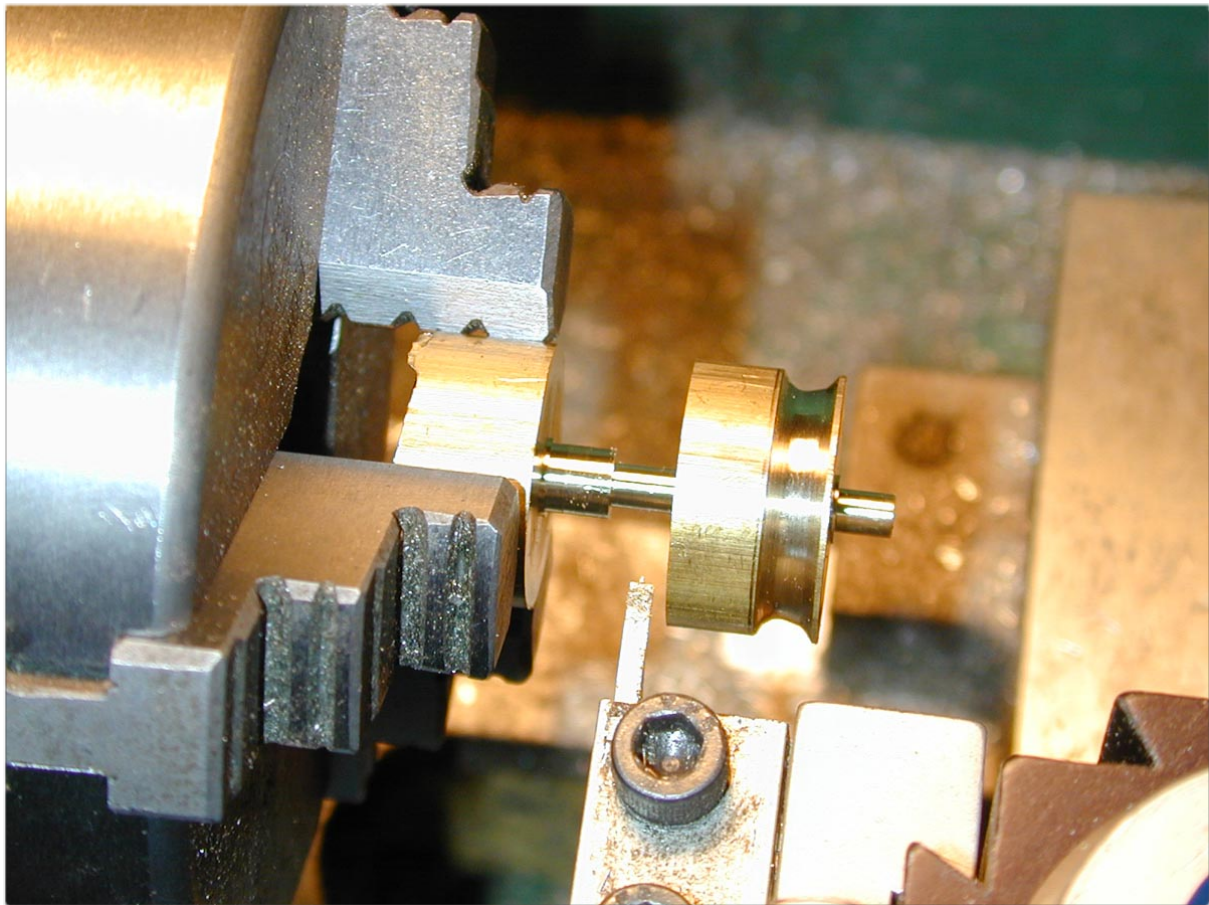


After reaming, you can disassemble the pieces and cut the center bar to it's final length of 4.5". Place the bearings in the arms with flange toward the center using Loctite 638 and allow to cure overnight.

The two pulleys are made from 1.25" round Aluminum 6061. Cut a piece about 1" long and mount it in the metal lathe. Drill a 1/2" hole through the piece and enlarge it to just a bit over 0.625" being careful to achieve a snug fit with the bearings. Shape the outside of the pulley, and part it off to a width of about 0.200". Place a bearing in each of the pulleys using Loctite 638.

Turn the cutter head on the metal lathe from a piece of 360 brass rod (0.75" diameter). The dimensions and tolerances are critical. In particular, the length should just fit between the bearings without any

extra space. Also, the axle needs to be aligned without any offset. For that reason, it would be best to cut the turn the entire piece without removing it from the chuck. It might seem easier to flip the piece around to cut the 1/8" shaft on the other side, but then you would run the risk of some slight mis-alignment.



After parting off the cutter head, clamp it in a vise to drill the 3/16" hole (I used a #12 drill for a bit more clearance). I used parallels beneath the cutter head to make sure it was level in the vise. Also, drill a hole for the set screw and tap it. (I used a 10-24 set screw). (Note: You could also drill the 3/16" hole and set screw prior to turning the piece).

Now it's time to check the fit between the arms of the frame. Without any shims, the cutter head spins very free. I added shims until I noticed a slight difference in how free the head spins. (In my case, I added three 0.001" shims. Your mileage may vary).

This is also a good time to check the balance of your cutter head. I bought several different lengths of set screw and used the one that gave the best balance.

Finally, it's time to mount the pulleys. The vertical placement is marked so that the belt from the cutter head to the pulley is parallel with the arms. I use 1/8" urethane belting to my overhead drive. Depending on how deep you made the groove in the pulleys, you'll need to make allowance. Mark the position of the center hole for the pulleys and drill/tap the hole. Put a 1/4" washer on each side of each pulley. The washers should be small enough so that they only contact the center of the bearing. (I actually used metric washers which were smaller outside diameter).

After the first few hours of use, you may want to check the fit of the cutter head between the arms again.

Have fun with your new cutter!

I would like to acknowledge the helpful discussions with David Lindow and Jon MaGill. Their willingness to share information helps all of us learn more about the art of Ornamental Turning.

Parts List

<u>6061 Aluminum</u>
1/2" x 1/2" Square
1/4" x 1/2" Bar
1.25" Rod
<u>360 Brass</u>
0.75" Rod
<u>Bearings (McMaster-Carr part numbers)</u>
2 ea. #57155K316 3/8" OD 1/8" ID flanged ABEC5
2 ea. #57155K377 5/8" OD 1/4" ID ABEC3
#99040A301 pkg 0.001 shims
<u>Miscellaneous</u>
Loctite 638
1/8" x 1.25" spring pin
1/8" x 1" spring pin
1/4-20 x 1.5" screw
2 ea. 1/4-20 x 1/2" screw
4 ea. 1/4" washers
10-24 set screw

