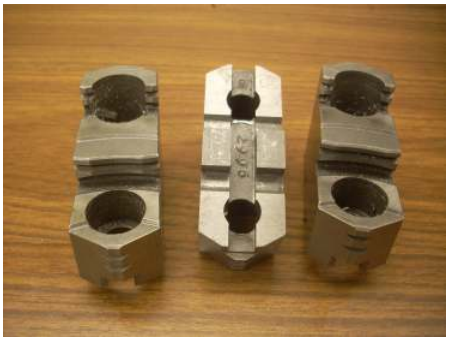
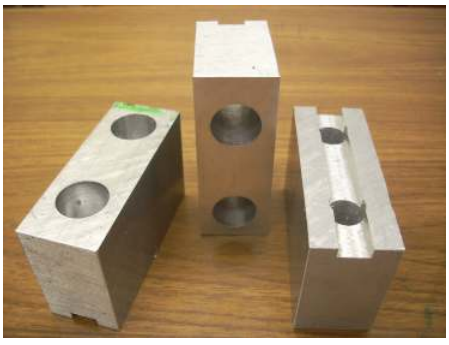
Making Soft Jaws for a Bison 3 Jaw Lathe Chuck

By R. G. Sparber

My Bison lathe chuck has served me well for many years. One of its features is the ability to remove the jaws from sliding supports and point them in the opposite direction. This is handy when I want to hold a part from the inside.



The jaws all have unique numbers and are a precision fit on their bases. They feel like they were lapped into place. I'm sure this provides a great deal of strength since surfaces exist in this interface to prevent any lateral motion.



This setup is ideal for installing soft jaws. I don't believe I need such a precision fit, just need to clear the major features. I have just knocked clearance holes with counterbores in blocks of aluminum. The milled slot is a very loose fit. These will not be as solid as the hardened jaws but then I don't intend to hog a lot of metal either.

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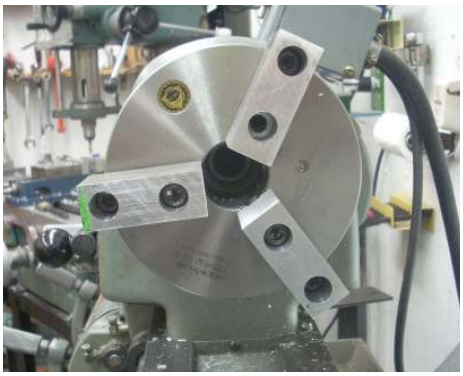


Here are my soft jaws installed on my chuck. There is plenty of metal available to shape into any fixture when the need arises. Then it can be re-cut for the next fixture.

As I use these soft jaws, I do plan to write them up in an article.

I started by selecting some 6061 aluminum that roughly approximated the hardened jaws outer dimensions. Blocks were then cut on my bandsaw, deburred, and cleaned. I then set up a stop on my vise so each block will be in the same position. I then realized that this won't work because I need to drill through holes. I would end up drilling into my vise ways.

The problem is easily solved by placing a piece of 1/2" Medium Density Fiberboard (MDF) down on the vise ways. MDF is remarkably uniform material with the top and bottom faces parallel within a few thousandths of an inch.

The block is now ready for machining.

I first take out the cutting tools I plan to use to be sure they can all reach. My longest tool is my 5/8" drill. The shortest tool is my 1/4" end mill. I want to set the height of the mill head so I can do all operations without moving the head. Any such movement will cause me to lose XY position.

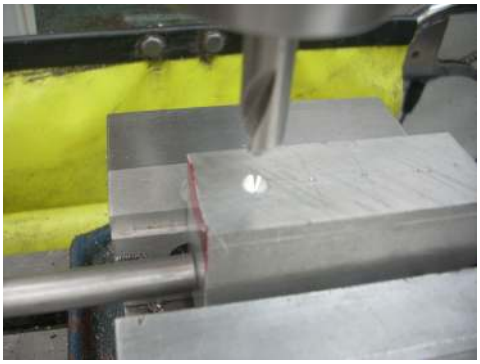
I install my Electronic Edge Finder (EEF) in my drill chuck to pick up my Y = 0 point along the back of the block. At touchdown, the EEF zeros my Digital Read-Out (DRO).

Any burrs or swarf could have thrown off my instrument.

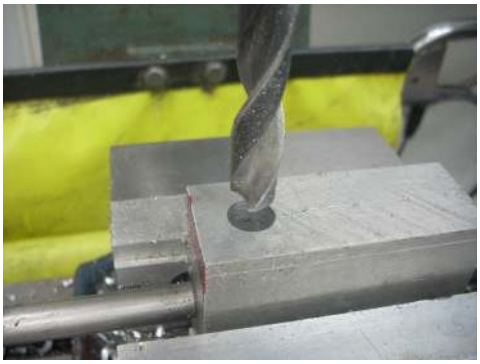
Next I set my X= 0 point. I can then drop in each of the blocks and have my DRO know where (0,0) is each time.

I'm using a spud to verify that my back left corner is my (0,0) point.

You may ask, "why the red line?" The block will look almost symmetric and I didn't want to get confused. That red line tells me which face started out facing up and near the left side of my vise.

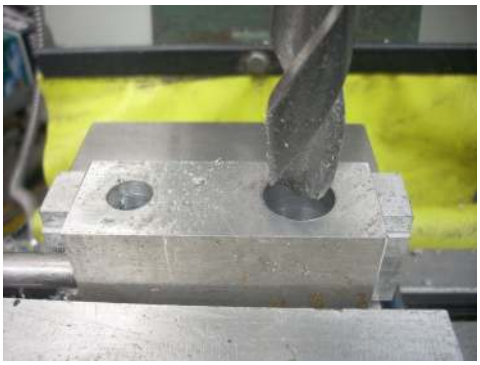


I watch my DRO to guide me to the first hole. Then I run a spotting drill to cut a small cone shaped hole.



Starting with a ¼" drill, I go all the way throughout the block and into the MDF. In order to prevent chips from clogging around the end of the drill, I drill only about ¼" before bringing the drill up. I then follow with my clearance drill.

I then unclamp the vise, clean out the swarf, and drop in the next block. When done I move over to my second hole.

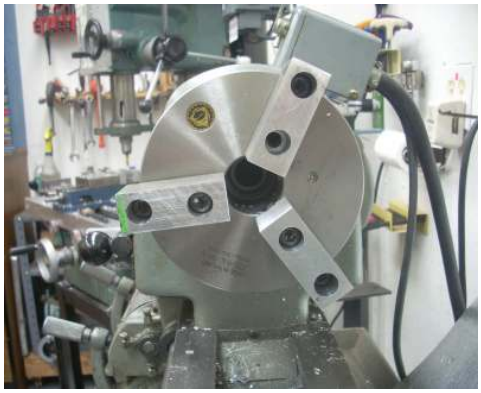


With all 3 blocks drilled with clearance holes, I chuck up my 5/8" drill in order to cut my counterbore. I may later cut the bottom flat but must make a cutter for that first.

One hole is 20 mm deep and the other is 29 mm. I wrote the depths next to each hole just to avoid making a mistake.

The batch approach is done again - drill, remove block, brush out swarf, drop in next block. The work goes fast.

After all holes were drilled, I swapped out my drill chuck for my 1/4" end mill. I then cut a slot in the bottom of each block.



Here are the soft jaws almost completely installed. One screw is left to install.

I have many options open to me with these jaws. I can machine the inside surfaces to hold round parts. I can cut a recess in the tops to hold something like a washer. Or I can cut the outside and hold a part by its inside diameter.

When cut in place and then used, the jaw's accuracy is based on the consistency of the lathe and not any run out of the 3 jaw chuck. Of course, this accuracy is lost when the chuck is removed from the lathe. For more about soft jaws, you can read

http://rick.sparber.org/Articles/sj/sj6.pdf

I welcome your comments and questions. All of us are smarter than any one of us.

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