Turning Non-precision Eccentrics in a 3 Jaw Chuck, Version 1.0

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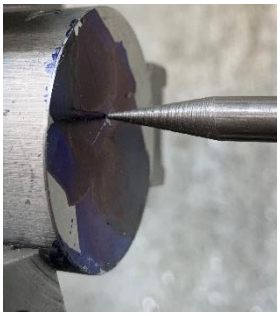
Some applications require turning an eccentric feature with high precision. For that, let me send you to Marv Klotz' outstanding eccentric calculator at www.myvirtualnetwork.com/mklotz/#intro and look for the file ECCENT.ZIP. You input the desired offset and it returns the needed packing that goes between one of the jaws and the stock.



The rest of the applications can get by with the accuracy achieved with a spud and scribed line. With care, you will be able to get within ± 0.005 inches of true.

It is common practice to add a shim of precise thickness between one jaw and the stock in order to achieve the desired eccentric location. This is a nice, fast way to go if you have the correct thickness shim. If not, you must either build up this thickness with a stack of shims or machine one. Not so fast anymore.

Wouldn't an adjustable thickness shim be nice?

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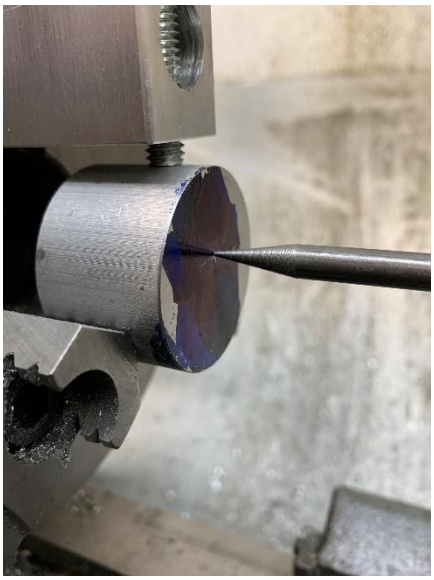
My solution depends on having a 3 jaw chuck with removable jaws that keep the
jaw carrier in the chuck body.

This proposed solution has one serious limitation: it must only be used with soft materials like brass and aluminum and only light cuts should be taken.



Here you see some round stock positioned off center and held in my 3 jaw chuck. The top jaw is the new part.

This top jaw bolts to the jaw carrier and holds a

5/16-18 length of threaded rod. The top end of this rod has been drilled and tapped 6-32. Then a 6-32 socket head cap screw has been coated with Loctite and installed. The other end has been cut flat and square.

The intent of having such a large mismatch in strength between threaded rod and socket head cap screw is to prevent the rod from being tightened. I only want the user to turn it with minimal force.

The stock is moved into position with the threaded rod backed away. Hand rotating the part relative to the bottom two jaws plus moving these jaws in and out can quickly get the spud lined up with the scribe marks or punch.

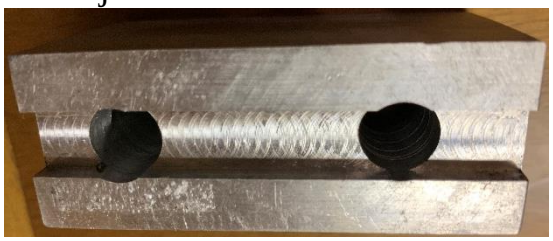
Then I use an Allen wrench to turn the threaded rod until it just kisses the stock.

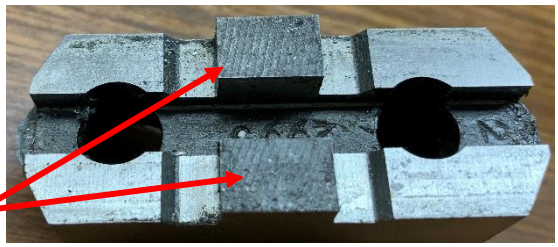
The clamping action occurs in the normal way: The chuck key is turned and all three jaws move inward until the stock is secure.

Words of warning: Compare one of the standard jaws with the end of the threaded rod which is threaded through the aluminum block. Note the huge difference in strength. Trying to use this arrangement to hog steel would risk having the stock fly out of the chuck. Light cuts on aluminum should be safe. I still do not recommend ever standing in line with the spinning chuck or part.

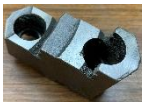
Note that when the square end of the threaded rod is flush with the bottom of the aluminum block, the screw at the top is flush. This is for safety. I did not want anything sticking out of the jaw that could hit machine or me.

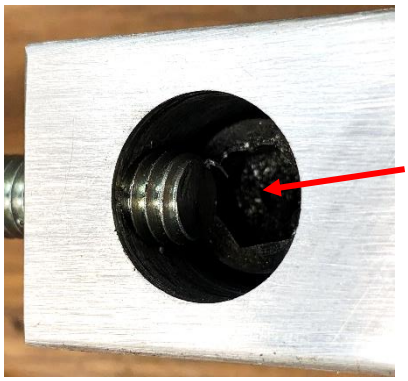
The jaw was made from aluminum and cut to be compatible with the bottom of the stock jaw.



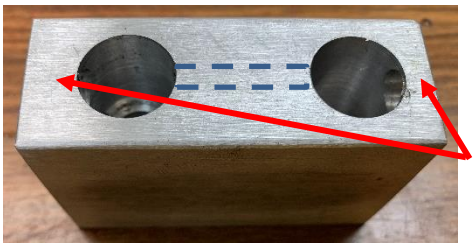


Since only a relatively small force is expected, there was no reason to machine in the rectangular blocks that resist normal force on the jaw.





The positioning of the hole that passes the threaded rod takes some care. It must be high enough to clear the socket head cap screws that secures the aluminum block to its jaw carrier.



My 5/16-18 tap is not long enough to cut threads for the full length of the block. So instead, I first drilled an “F” tap hole end to end. Then I enlarged the end sections with a “P” clearance drill. This let me tap the center section shown in dashed blue lines.

Here you see the custom jaw holding some ½ inch diameter aluminum round stock. Cutting the eccentric spud shown here felt the same as when I cut a similar part using packing.

Acknowledgments

Thanks to Marv Klotz for his amazing library of math based shop tools.

I welcome your comments and questions.

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