

Making A Limited Range Jacobs Flex Collet[®], version 2

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Recently I had the great fortune of receiving a Tapmatic[®] 50X tapping head. It can drive taps as small as a 4-40 and as large as 1/2"-13. To do this, there are a series of Jacobs Flex collets needed. Each one holds a range of tap sizes. For example, the collet that came with the head is good for taps from #4 to 1/4". In



order to take advantage of the full range of tap sizes, I would need to buy two more of the collets. The total cost would be over \$80. Ouch! Time to look for another solution.

This article details how I made a more limited range version of a Jacobs Flex collet. Each of my collets only holds one tap shank diameter. To my surprise, many of my large taps have the same diameter so I only had to make a total of three collets.

With my one real Jacobs Flex collet in hand, I was able to measure its taper and use it to set the compound on my lathe. I was also able to measure the largest diameter of the collet and its overall length. That is all I need to duplicate the outer shape. In general, I have not furnished dimensions for this collet because so many variations exist. But as long as you can get one collet sample, you will do fine.

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I cut a 3" piece of mild steel that was slightly larger in diameter than the collet. This will let me make all three collets plus have plenty to grab in my lathe chuck.

Drill rod would have been more durable but I don't expect that to be an issue.



After deburring, I chucked the bar into my lathe and turned the maximum outside diameter for about 1". The collet is about 0.51" long but the excess will not be wasted. It is used to start the next collet.

I then squared up the end, marked the finish overall length, and cut my taper. When the taper reached the layout line, the outside was done. I used my parting tool to cut a shallow groove at the finish line. It will be handy during final finishing. (Brian pointed out that if I cut the groove deeper, it would be my reference surface for this end.)



It is then a simple matter of selecting a drill that is close to the diameter of the tap shank I wish to hold. Make your smallest inside diameter collet first for reasons that will become clear soon. The hole is about 3/4" deep.

If this is the first collet, I need to mark my saw cuts. I did this by first setting one jaw of my 3 jaw chuck horizontal using a small bubble level. Then I ran my cutter across the end of the part. Again using the bubble level, I set the jaw vertically and ran the cutter across the end. This will yield a 4 jaw collet. If more jaws are needed, scribe the appropriate number of cut lines.



I separated the jaws by using my bandsaw. The surfaces left by the saw blade will be a little rough

but that is a good thing. Each saw cut is approximately 3/4" deep.



My last machining step was to deburr the saw cuts inside and out.

I then used carburetor cleaner to completely degrease the part. It must be free of swarf and completely dry before proceeding.



This is the fun part. I squirted 100% silicone caulk into the blind hole and followed by slowly pressing in the shank end of the drill used to make the hole. I then removed the excess from the outside of the part. Inspect each cut to be sure it is completely filled.

After waiting a few minutes, I slowly rotated the drill shank and pulled to remove it without disturbing the caulk which has already started to skin over.



I am left with a neat slab of caulk between each jaw of the collet. The rough saw cuts give the caulk plenty to grab.

Now comes the hardest part. I had to wait a full 48 hours for the caulk to cure.

I rushed my first prototype and found that some Crazy Glue® worked well to stick the caulk back onto the jaw edges.



I then sawed the part off the bar. Using a belt sander I smoothed the end plus did my best to square it up. The shallow parting cut helped me see where to remove metal.

Note I am left with the end of the bar stock ready to make the next collet. The outside diameter has been cut so I only need to cut more of it to get back to about 1" of length. The centering hole for the next larger size is also in place along with the start of my two saw cuts.

All 3 jaw chucks have some run out. By removing the bar and later putting it back in, the center of rotation will shift a little. My tapping head tolerates a fair amount of run out so this was not an issue. If you are concerned, scribe a line on the bar stock and note which jaw of the lathe chuck is next to it. Then do your best to place it back into the chuck at the same orientation each time.



Here is a family portrait. With this set of flex collets, I can hold any of my taps from 4-40 up to 1/2 -13.



Here I've got a tap being held by its flex collet. The tapping head on the right has a matching taper. As the nut, shown on the left, is tightened, the flex collet is compressed and tightly grabs the tap's shank.



As a test, I have drilled a tap hole and run my 5/16 - 18 tap through it. It performed just as well as my 1/4 - 20 tap held in a real Jacobs Flex collet.

I look forward to using these collets in my new tapping head. I also look forward to finding other applications for the cut-caulk-saw apart trick.

Acknowledgements

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

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