Auxiliary Pen Blank Jaws

Introduction

Two potential basic problems with drilling pen blanks are: holding the blank on the same axis and centered on the drill, and keeping the drill from deflecting. A good (as opposed to the definitely sub-optimal one I bought) self-centering vise will take care of the first problem when drilling on a drill press. The second problem is a bit harder. You could start the drilling with a combined drill/countersink and then swap it out for your drill bit, but that takes a good bit of time. Alternately you could use a floating jig to hold the drill blank, but that reintroduces the problem of starting the hole in the middle.

Consider drilling on the lathe. You can easily create a starter dimple for the drill with a skew or the like—or you could easily swap a combined drill/countersink and drill bit by using two drill chucks. Holding the pen blank can be another matter. The #1 jaws on my One-Way Stronghold chuck will hold square pen blanks well—but those are hardly ever the jaws on my chuck. There’s also the problem of not quite square pen blanks. A four jaw chuck can grip a non square pen blank so it is off center by as much as the pen blank is off square, as in Fig01. Even worse, the four jaw chuck can grip the pen blank so that its axis is skewed with respect to the lathe, as in Fig02.

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**Fig01:** This photo, in an exaggerated form, shows one of the problems gripping pen blanks in a standard four jaw chuck. If the blank is rectangular rather than square, it can be gripped off center.

**Fig02:** Again in an exaggerated form, this photo shows another possible error in holding pen blanks in a four jaw chuck. The rectangular blank is gripped at an angle to the axis of the lathe.
I set about to fix this problem (not that I do that many pens, but I do make a product that depends on tapered mortises in similar spindle stock made by first drill and then reaming) by buying a really cheap dedicated chuck which I planned to make wooden jaws for. I didn’t count on it being such a small chuck. While casting about for an expedient way to make the wooden jaws a much simpler solution that wouldn’t require removing any of the jaws normally on the chuck occurred to me. These auxiliary Pen Blank Jaws are the subject of this article.

They’re made using aluminum angle and bar stock available from big box hardware stores. Briefly, the two 1” pieces are cut from the angle stock, and four 1.5” pieces are cut from bar stock. Holes are drilled in the angle stock to hold rare earth magnets (the magnets only hold the jaws in place until the chuck is tightened—the hold power is not a function of the magnets). The magnets are pressed in place. A simple jig is made to facilitate assembling the jaws. Two bar stock pieces are glued to each angle piece with epoxy glue to create 90 degree recesses at the center of the jaws. The Auxiliary Jaws are slipped over two opposite jaws on the four jaw chuck. The pen or spindle stock is placed between the Auxiliary Jaws and held by opposing corners.

I rather like the Auxiliary Jaws. I can slip them on in seconds as long as any regular metal jaws are on the chuck. They hold both square and only rectangular bandsawn blanks straight and centered as in Fig03. I can quickly cut a starting dimple and then drill. As the drill is advanced by turning a wheel, there is less tendency to accelerate the rate of advancement when the end of the blank is hit, reducing the possibility of breakout.

Fig03: This is the same rectangular block that demonstrated the possible problems in Fig01 and Fig02. By holding by two opposite corners the Auxiliary Jaws will hold even rectangular stock on axis and centered. It only will have problems with tapered blanks.
A Word on Safety

The Auxiliary Jaws are meant for drill pen blank or similar stock at low speeds. While it may easily occur to you that they could be used to hold miniature square spindles for turning I do not suggest this. Besides putting your fingers close to the jaws of your chuck, the auxiliary jaws are held in place on your metal jaws by the blank they are holding. Should the blank break or fail, or a glue joint on the jaws fail, the Auxiliary Jaws would likely be thrown from the chuck. So don’t operate your lathe over the speed at which sharp edged angle stock thrown at you would hurt.

Material

1.5” wide, 1/8” thick aluminum angle stock
1” wide, 1/8” thick aluminum bar stock
Four ¼” rare earth magnets
Epoxy glue

Making

Prep

Begin by cutting the aluminum pieces. Carbide tipped saws will cut aluminum well. I used a miter saw, as I didn’t need to put my fingers anywhere near the pieces. If the saw did grab and throw a piece, it would be rather uncomfortable, especially the sharp edges. Fig04 shows cutting the angle stock to 1” lengths. A stop block is used for consistent length and the built in clamp keeps fingers out of the danger zone. Fig05 shows cutting the bar stock to 1.5” lengths. If you don’t have a miter saw, Fig06 shows a way to keep your fingers out of the way on the table saw by using a sled and two clamps.

| Fig04: Cutting Aluminum Angle with a miter saw. Use a clamp to hold the stock and a stop block for consistent length. Keep your hands away from the cut. If your saw has an auto-stop feature wait until the blade stops before lifting it back up to avoid throwing the cut off piece. | Fig05: Cutting the Aluminum Bar stock with a miter saw. Again, use a clamp and stop block. |
Clamp an angle to your drill press table (Please don’t hand hold them) and drill a ¼” hole near the outside bottom corner as in Fig07. Drill all the way through; don’t try to drill the depth of the magnet as if the hole is even slightly shallow the magnet will stand proud of the aluminum and throw off alignment. Switch the angle to the other side and drill another hole. Be sure to drill near the same edge. Repeat drilling for the other angle piece.

Use a utility knife or deburring tool to remove any burrs on the edges and holes as in Fig08. Lightly sand the faces that will be glued (outside of angles, either face of bars) by rubbing them back and forth on a piece of abrasive held on a flat surface as in Fig09. This will improve the glue dependability.
Press the magnets into the drilled holes on the angle pieces. This is easily done by placing the magnet on the face of a vise jaw, holding the angle hole in the angle lined up with the magnet, and closing the vise as in Fig10. Make sure the magnet is aligned with the inside face of the angle, and is flush with the face.

Fig10: Pressing the rare earth magnet into the hole drilled in the aluminum angle. Using a vise keeps the magnet from skewing as it goes in and insures that it ends up flush with the inside surface of the aluminum angle.

Fig11: The gluing jig and all of the cut aluminum parts.

You can make a simple jig to aid in aligning the pieces when gluing. Find or cut a piece of wood 6” to 8” long and 1” thick. Find or cut another piece of wood and glue it to the bottom of the first piece so that it forms a shelf about \( \frac{3}{16} \)” wide. Fig 11 shows the completed jig and the prepared aluminum parts.

**Gluing**

It’s easier to handle the jig if it’s held in something—I clamped mine in a vise. Use masking tape to hold one of the angle pieces so that one face is against the jig and the bottom edge is resting on the shelf as in Fig12. Mix up a small amount of epoxy glue. I mixed the glue on wide masking tape using a bamboo skewer to stir as in Fig13. You only need to mix enough glue for one face. Spread the glue on the sanded face of a bar piece. Place it on the exposed face of the angle. Move it around a bit to insure even glue distribution then use masking tape to clamp the bar in place. Be sure that the edge of the bar piece is all the way against the jig and that the bottom corner is against the shelf as in Fig14. Let the glue set as directed on the glue packaging.
**Fig12:** The set-up for the first gluing. The jig is clamped in a vise and the angle is taped to the jig.

**Fig13:** Mixing epoxy glue.

**Fig14:** After spreading glue on the sanded face of the bar piece the bar is placed against the face of the angle piece and clamped in place with tape. Be sure that the edge is against the jig and the bottom corner of the edge is on the shelf of the jig.

**Fig15:** The modification to the jig for the second gluing. A scrap piece of aluminum bar is taped to the jig to register the second bar piece into the correct position.

After the glue is cured, remove the piece from the jig and remove the tape. Tape a scrap piece of the same bar stock source to the jig as in Fig15. Tape the previous glued pieces to the jig so that the bar piece is against the jig with its bottom on the shelf and the middle edge butted against the scrap piece. Mix up more glue and glue a second bar piece on to the angle piece clamping it in place with masking tape as in Fig16. Make sure that the edge of the bar is squarely against the scrap bar piece and the bottom corner of the bar is on the shelf. Wait for the glue to cure.
Repeat all these steps to glue up the second auxiliary jaw.

**Adjustment**

Optionally you can flatten the bottom edges of the Auxiliary Jaws. To do this place the Auxiliary Jaws in place on opposing jaws of your four jaw chuck. Use them to clamp a small turning square. Clamp snugly, but don’t over tighten or you may cause a glue joint to fail. Wear eye and preferably face protection. Turn on the lathe at a moderately slow speed and use a small bowl gouge to flatten the jaws as in Fig17. Take very light cuts. Unclamp the 4 jaw chuck and remove the Auxiliary Jaws.

Optionally you can round over the top corners in case your fingers get in the way. Place the Auxiliary Jaws on opposing jaws of your four jaw chuck and clamp a small turning square with them. Taking gentle cuts, round over the top corners as in Fig18. Remove the Auxiliary Jaws from your chuck and round over edges of the corners and end edges with some sort of sander. The finished Auxiliary Jaws are shown in Fig19.

Remount the Auxiliary Jaws on opposing jaws of your four jaw chuck and clamp a sample pen blank that has the center located by corner to corner diagonal lines. Try to center the Auxiliary Jaws on the pen blank so that the entire middle edges of the jaws are engaged. Turn on the lathe and use a pencil to mark the center of rotation as in Fig20. Turn off the lathe and check to see if the center is accurate. If it is not, try switching the Auxiliary Jaws to a different pair of jaws on the four jaw chuck. If the problem persists you can shim the appropriate edge with masking tape.
Fig 18: Optionally, after rounding the outside to corners to make the auxiliary jaws more finger friendly.

Fig 19: The completed Pen Blank Auxiliary Jaws.

Fig 20: Testing the centering with a square blank. Draw corner to corner diagonals to locate where the center should be, then turn on the lathe and mark the actual center with pencil.
Using

To use the Auxiliary Jaws, place them on opposing jaws of your four jaw chuck letting the magnets hold them in place. Clamp your pen blank or spindle stock by the corners between the Auxiliary Jaws. Make sure the entire center edges of the Auxiliary Jaws are engaged. Turn on the lathe at a slow to moderate speed and use a skew or other tool to cut a starting dimple for the drill bit as in Fig21. Then advance the drill bit (I really like parabolic flute drills) into the pen blank as in Fig22. Start drilling slowly, and retract the drill frequently to clear the chips. If chips start to clog up in the flutes rather than exiting freely it will tend to send the drill off center. Keep the rate of advance slow as you exit the blank to avoid blow-out. Fig 23 shows three sample drilled pen blanks from front and back. One blank is a square maple piece, another a rectangular piece of more exotic flamewood, and one is bias cut laminate of maple and padouk.

| Fig21: Cutting a starting dimple with a scraping cut with the point of a skew. | Fig22: Drilling the blank. Keep the speed down and withdraw the drill to clear chips before it begins to clog. |
Fig23: The results from front and back. On the top row from left to right, is a plain maple square, then a rectangular exotic flamewood, then a maple/padouk laminate cut on a bias (which could try to push the drill off center following the grain). The exit, or back is the bottom row.

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