Bullet Pen Casing

Contributed by: David Bell

Bullet Casing Pen Tutorial

This tutorial is designed around the bullet casing for a 30.06 bullet and does not include the actual turning technique for the cap of the pen.

For this tutorial some of the tooling has been made specifically for certain techniques used to assemble or build this casing. I will try to be as specific as possible in explaining each step as I progress through the tutorial. For any questions about specific items or techniques used in this tutorial, you can find my contact information at the end of this tutorial. I hope you enjoy and gain a better understanding of the bullet pen from this tutorial.

David Bell….Bellsy

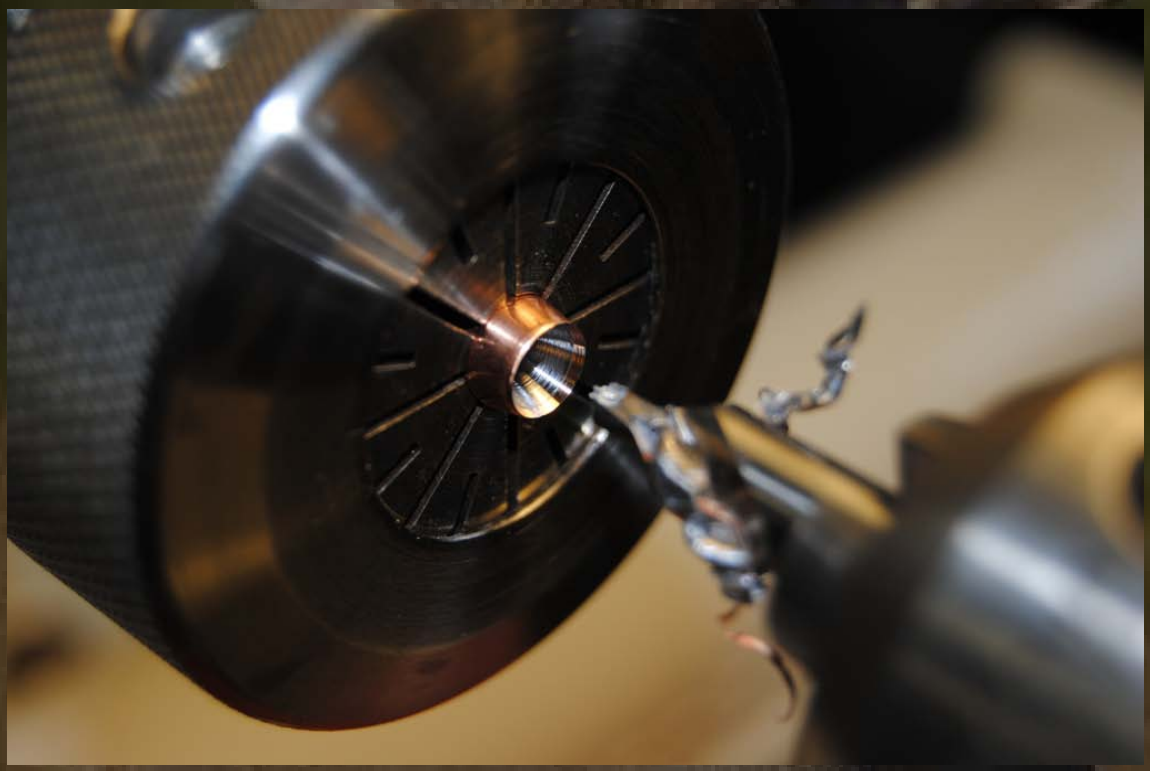
Bullet Casing Pen Tutorial

The following tools were used to make this bullet casing:

- 7mm Slim Line or Euro Pen Kits
- Collet Chuck (full set of collets, metric or imperial)
- Closed End Pen Mandrel (optional)
- #4 Center Drill
- ½" Drill Chuck
- 5/64" drill
- 3/16" drill
- 7mm drill
- Swaging Tool *
- Soldering Jig *
- Solder
- Solder Paste
- Sandpaper 400 -1500 grit
- #0000 Steel Wool
- Lacquer Thinner
- Metal Lacquer
- Pen Press
- Dental Wax
- Lacquer Dipping tube and stand *
- 7mm pen kit
- 30.06 bullet casing (spent or new)
- FMJ (Full Metal Jacket) bullet tip
- 3/8"dia. steel pipe brush
- Bullet Casing Press Die *
- The * symbol denotes tools that were custom made.

Bullet Casing Pen Tutorial

To begin the tutorial we will start by drilling out the bullet tip. To do this I start by drilling into the blunt end of the bullet tip with the #4 center drill until there is a small bevel created on the inside of the bullets copper jacket.



The next step is to drill out the lead from the bullet tip with a 3/16” drill bit. I have had good success being able to drill out @ 95% - 100% of the lead in one step. The key to being able to do this is the proper amount of friction/heat that is generated during the drilling process. For this tutorial I purposely stopped part way through the process to take

Bullet Casing Pen Tutorial

pictures and this is why you will see two portions of lead. An alternative to removing the lead is to melt it out, but I find this unsafe due to the fumes created. The following pages show my drilling results.

There is a small mark placed on the 3/16” drill to gauge the depth of the drilling. This mark can be calculated by placing the drill beside the bullet prior to drilling. I recommend placing a mark on the drill with a dremel tool.

Bullet Casing Pen Tutorial

The next step is to drill out the bullet tip with the 5/64” drill for the pen refill. Use the pen refill as a gauge after drilling to determine if the hole is correct. Do not force the drill bit through the copper, this needs to be done with small in and out cuts with the drill.

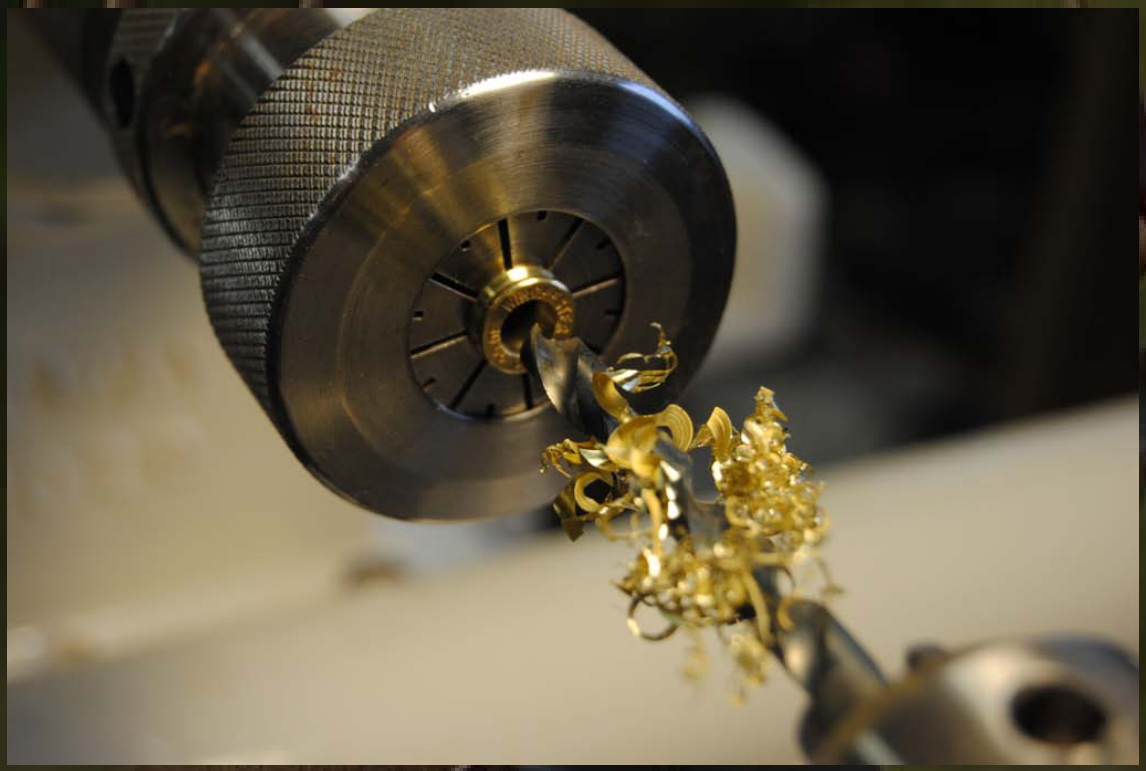
Bullet Casing Pen Tutorial

Now the bullet casing can be drilled out. For this we begin using the #4 center drill and drill into the firing cap end. If the bullet is a new casing, then we do not need to use the center drill. Place the bullet casing into the collet chuck and drill through the firing cap with the center drill. You may choose to remove the firing cap by using a small punch and driving it out of the bullet casing versus drilling it out. I recommend drilling it out rather than trying to find the proper tooling to punch it out.

Bullet Casing Pen Tutorial

The next step is to drill out the casing with the 7mm drill.

Bullet Casing Pen Tutorial



For the next part we will be preparing to solder the 7mm tube into the bullet casing. There are a few tools used in this next part that I have manufactured specifically for this process. My reason for doing this was to reduce the probability of damaging the mechanical transmissions while pressing them into the bullet casings. Below is a picture that shows the sectional view of a casing. I will try to explain the problem that some people have encountered, including me. The two tools that I will be using are the Swaging Tool and the Soldering Jig and more information about these tools can be found at the end of this tutorial.

Bullet Casing Pen Tutorial

In the above picture I have taken a standard 7mm tube and pressed a transmission into the tube. I then placed this into the sectioned 30.06 bullet casing. The second transmission was placed in relation to the first one to give you an idea of where the transmission is located after pressing. As you can see, there is a part of the casing that the transmission passes through where it is solid material. *(The ends of the transmissions are aligned, but do to the photo resizing and editing, they appear to be uneven.)* Due to this area of solid material, there is no room for expansion of the brass tube when the transmission is pressed in. In order for me to get around this problem, I thought about lots of solutions, but I wanted one where the tube and casing became one. There are lots of ideas in the forums and in other tutorials, but none of

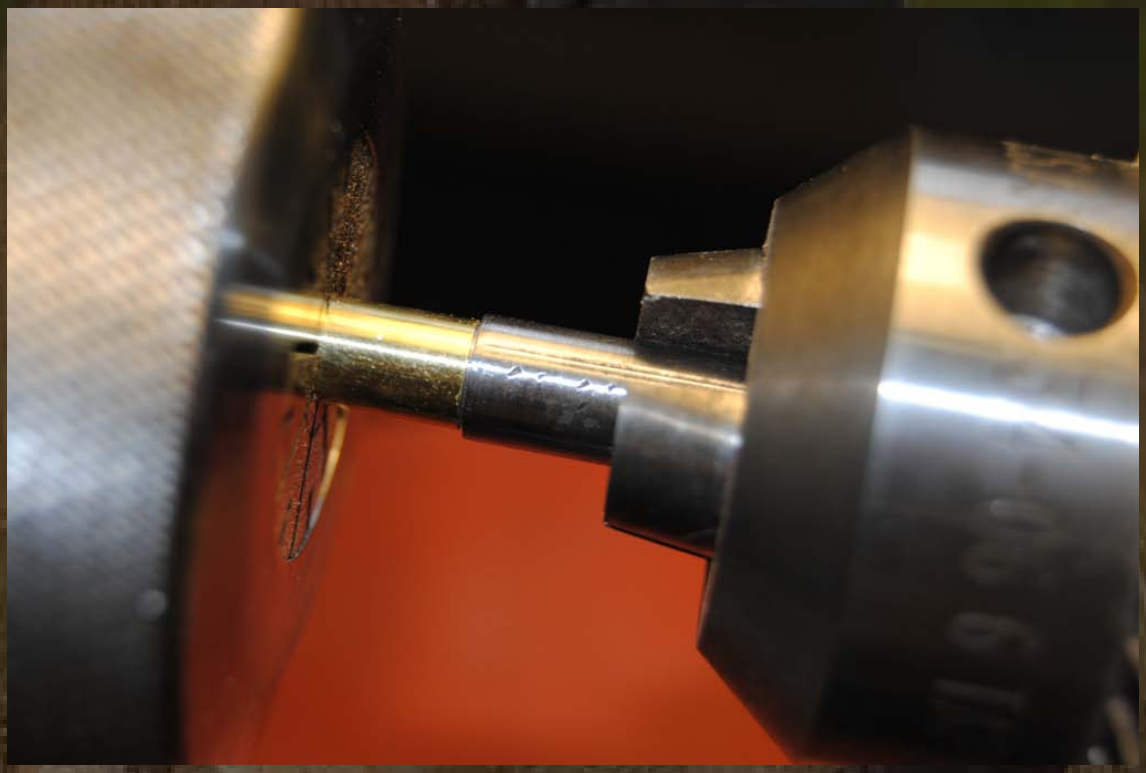
Bullet Casing Pen Tutorial

these left me feeling confident. I began to take some measurements and found that even after drilling out the casing with a 7mm drill I had a few thousands of an inch to play with. I sacrificed a 7mm tube and a transmission and found that the outside diameter of the brass tube with the transmission pressed inside of it, still fell below the inside diameter of the 7mm hole in the end of the casing. I also sectioned the 30.06 bullet casing and determined the actual depth of the solid brass section at the firing cap end of the bullet casing. Seeing that the brass portion of the twist mechanism was well inside the end of the bullet casing, I realized that the expansion of the 7mm tube did not actually start until the transmission was past the full cross sectional area of brass within the bullet casings firing cap. My problem then appeared to be, how do I get the transmission past this point without damaging it during pressing? The answer was actually quite simple, swage or expand the brass tube in an area that is equal to the length/depth of the bullet casings firing cap area. To do this I machined a small tool which I called a Swaging Tool. I will now go through the steps of soldering the 7mm brass tube into the bullet casing with the aid of the Soldering Jig.

The first step is to place the standard 7mm brass tube into the collet chuck. I then take the swaging tool and press it into the end of the brass tube. This can be done in several ways, by hand while the lathe is turning (handle is required) or by using the lathes tailstock and drill chuck as a press. The latter is safer…….believe me! A small amount of lubricant does not hurt either. This can easily be cleaned off later. Below are the before and after pictures of the swaging process.

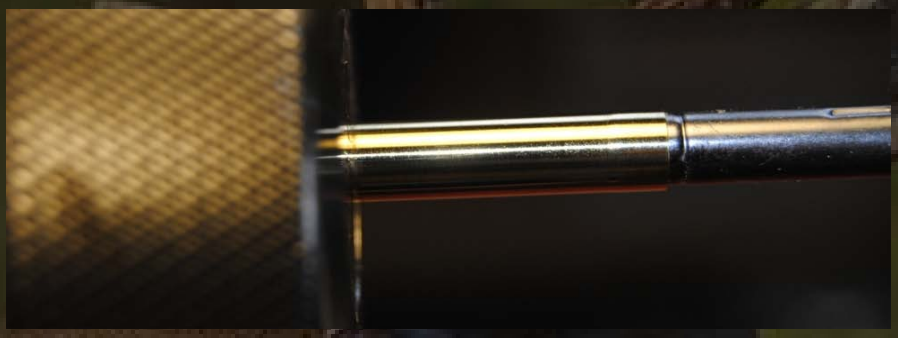
Bullet Casing Pen Tutorial

Before



After

Bullet Casing Pen Tutorial



Bullet Casing Pen Tutorial

Too check if the swaging is correct or not take a twist mechanism and insert it into the end of the 7mm brass tube where it was swaged. If the transmission fits, the step was completed successfully. The next step is to lightly polish the outside of the 7mm brass tube with some #0000 steel wool. Remove the 7mm brass tube from the collet chuck and set it aside. See page above.

Now take the 30.06 bullet casing and trial fit it onto the soldering jig. Depending on whether the casing is new or a spent one, you may have to resize the bullet tip end of the brass casing. To close the opening, I made a homemade tool for decreasing the brass opening. It is a small piece of brass with a 60 degree chamfer on the inside. I place it in the tailstock drill chuck and press it against the end of the bullet casing while it is turning in the lathe.

Bullet Casing Pen Tutorial

Place the 30.06 casing onto the soldering jig and/or trial fit the bullet tip into the casing. Once the casing opening is correct, leave the casing on the jig as shown below.

The next step is to place a small amount of soldering paste onto the outside end of the 7mm brass tube that has been swaged. Don't worry if you get to much soldering paste on the brass tube, this can be cleaned up afterwards.

Place the 7mm brass tube into the end of the 30.06 bullet casing leaving the swaged end of the brass tube located at the top. Slide the brass tube down until it bottoms out on the soldering jig inside the bullet casing. There should only be @ 1/64" of brass tube sticking out above the end of the top of the bullet casing. The brass tube may even sit flush with the end of the casing. The reason for this is that there are

Bullet Casing Pen Tutorial

different manufacturers of 30.06 bullet casings and the length of the casings may vary. This is also possible for the length of the bullet tips, but these things are easily fixed. Your soldering jig, bullet casing and brass tube should now look something like this before we start to solder.

The next step is a bit challenging, especially if you're not to proficient with soldering. I recommend a good pair of glasses or a magnifying glass arrangement for seeing the solder joint to be soldered. I am at the point where I need glasses for things up close, but not for reading.

Oh the signs of getting old…..sigh!

For the soldering you're going to need solder paste, solder and a source of heat. Some people claim a soldering iron will work, but I choose to work with what works! A propane torch….just like the one in my first video. ******** Solder diameter used was 0.032"********

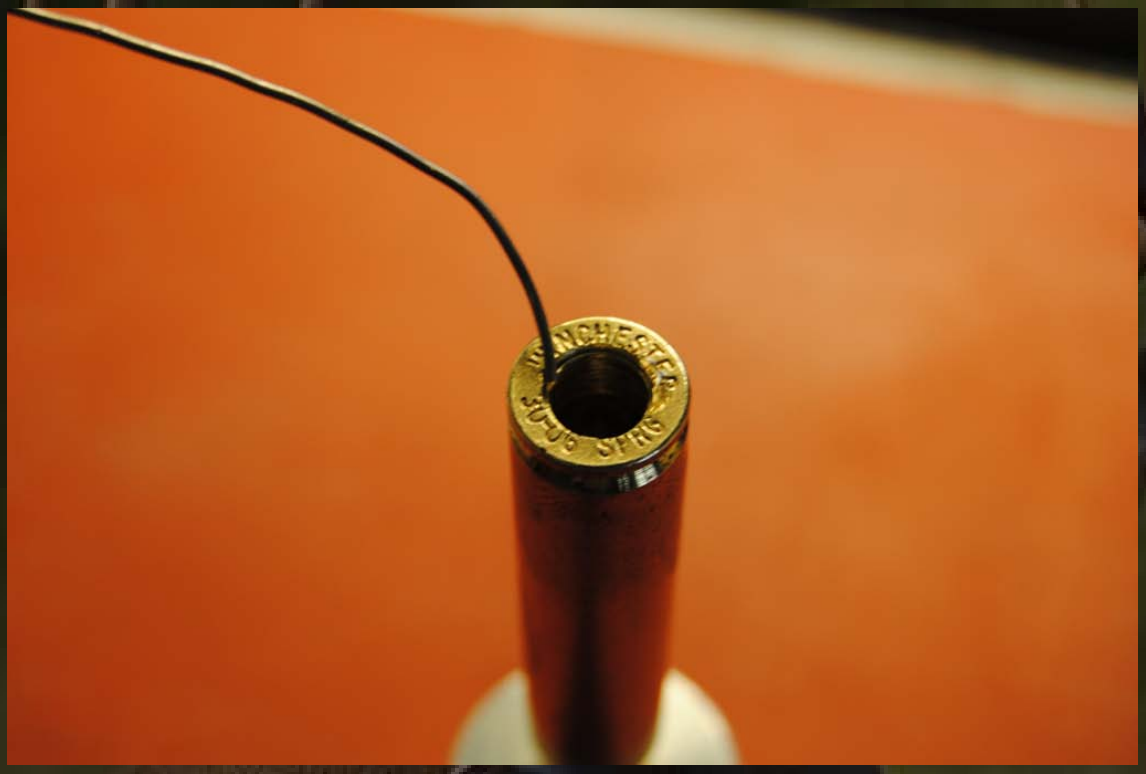
Bullet Casing Pen Tutorial

Now that we have all of the soldering stuff ready, solder the brass tube to the casing. Apply heat to the top ¾" of the casing and when the solder begins to boil out of the solder joint touch the solder into the joint….not the inside of the brass tube or all over the end of the casing. Trust me here……☺

Ok I guess I better tell you now rather than later. When you go to touch the solder to the joint, place the solder wire into the joint where there is no manufacturers writing on the end of the casing. This will make for easy cleaning after the soldering is finished. You do not need to use a lot of solder to weld the joint, if you have used more than 3/8" in length of solder wire…..**your done!**

Below are the Before and After pictures of soldering.

Bullet Casing Pen Tutorial



Before

After

Bullet Casing Pen Tutorial

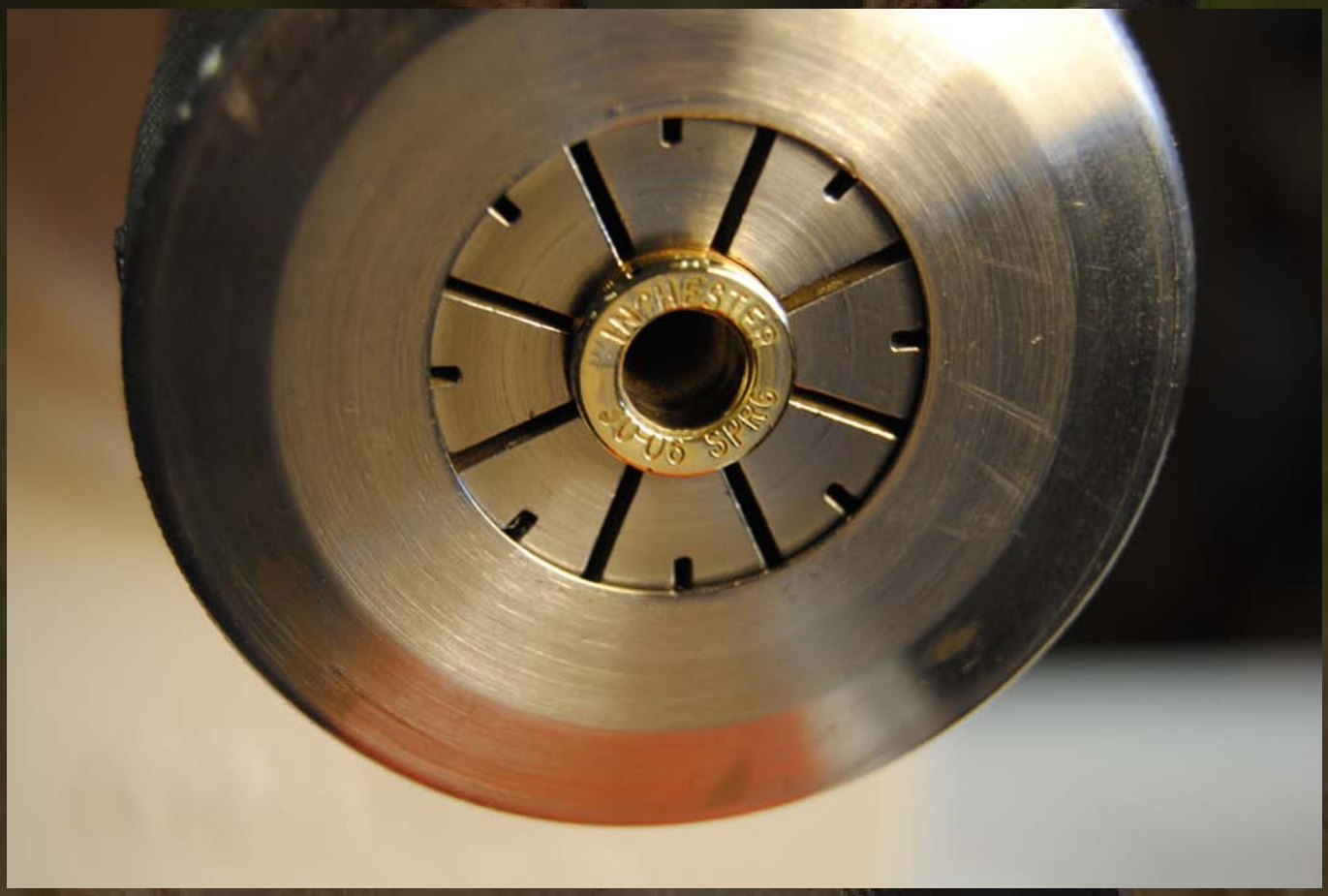
Ok so I got a little solder on the end of the bullet casing…..let's fix it.

The good thing about brass, solder and #0000 steel wool is that when applied properly, they create heat and heat melts solder. The steel wool also removes the solder, as well as, polishes the brass.

Now before I get ahead of myself here, I mentioned that not manufacturers make their parts the same size, but for the most part the sizes are very close. So having said that, there may be a small portion of brass tube sticking out of the bullet casing. To remove this either drill the end of the bullet casing with the #4 center drill or use a de-burring tool to remove the excess 7mm brass tube. Then polish the end of the bullet casing with the #0000 steel wool to remove any excess solder.

Bullet Casing Pen Tutorial

Once the steel wool has been applied keep checking the end of the bullet casing to see that all of the solder has been removed. I have purposely applied solder to the end of the bullet casing to fill in all of the manufacturers identifications; it does add some character to the pen, even though it is rarely seen. For this tutorial I have left some of the solder to show this.



With the soldering and polishing completed, now take the twist mechanism and test fit it into the end of the bullet casing to make sure it is going to fit down into the end of the 7mm brass tube that was swaged.

Bullet Casing Pen Tutorial

If the twist mechanism does not fit because you accidently put solder inside the 7 mm brass tube…….don't get to excited. This is so easy, you will Thank me later…or not!

Grab the 3/8" diameter pipe brush and place it in a small tap holder. Turn on the lathe to a medium speed. Insert the pipe brush into the swaged end of the bullet casing and using an in and out motion gentle hone the inside the brass tube. Check the fit of the twist mechanism often and stop honing the brass tube as soon as the twist mechanism fits properly. This is one of 2 times you will need this brush. The second is mentioned in the next part of the tutorial. Remove the bullet casing from the collet chuck and turn it end for end.

Bullet Casing Pen Tutorial

Pipe Brush

The next part of the tutorial is to fit the bullet tip into the bullet casing. For this we have already sized the tip of the casing prior to placing the bullet casing onto the soldering jig. We now need to clean the inside diameter of the bullet casing so that we can glue the bullet tip in with CA glue. Test the bullet tip fit with a refill as shown on page 22 below.

Bullet Casing Pen Tutorial

Once again use the bottle brush to clean the inside of the bullet casing. This will clean it out well enough for us to solder in the bullet tip. When the casing is clean enough for CA glue to be used, take the bullet tip in hand and lightly sand the portion of the bullet tip that will be placed into the bullet casing. Trial fit the bullet tip into the casing to make sure there is still a snug fit. If the opening is too big, simply repeat the resizing as shown on page 11 of the tutorial.

With the casing and the bullet tip ready for assembly, place a small amount of CA glue (thick) inside the end of the casing. Rotate the casing 180 degrees and apply the same amount of CA glue again. Insert the bullet tip and twist it as it's pushed into the bullet casing. The bullet tip will come to rest against the end of the 7mm brass tube. The bullet will also be centered against the 7mm brass tube because there is a slight chamfer inside the bullet tip that allows to tube to align itself. The amount of bullet tip that sticks out of the bullet casing is already calculated for you in the soldering jig dimensions.

Bullet Casing Pen Tutorial

This completes the assembly of the bullet casing. From this point forward we will be discussing the sanding, polishing and finishing of the bullet casing. I will be performing all of the steps using a collet chuck. The alternative to the collet chuck is a closed end pen mandrel for holding the bullet casing, but due to weakness of a closed end pen mandrel I only recommend using it if you need to remove scratches or marks that are caused from holding the bullet casing in the collet chuck.

As a rule I finish my bullet casings until there is a mirror finish without the visual imperfections of sanding lines and nicks and gouges. That's my level of quality; your level of quality may be different.

Some notes to add about finishing brass. Brass casings are somewhat forgiving and what I mean is, even when a small nick or scratch does not appear to be going away for you. Don't give up hope to easy. Sanding does not remove as much material as you might think it does. Unless of course your using 220 grit or heavier. You might even try sanding along the length of the casing. This helps blend out a defect when you return to sanding the casing around its body. You will be surprised just how much can be fixed when a little bit of work and effort are put into this process. Another tell tale sign that the brass is getting to thin, is that the brass will appear to burn or discolour. This is when you know you cannot go much further. I have never sanded through a bullet casing, but something tells me that if I did, the end result would be bad for my fingers. When using the #0000 steel wool to polish, do not let it overheat the brass. The steel wool is for polishing the brass, not sanding it. The last item is wet sanding……highly recommended. The water helps cool the brass and it provides a lubricant for the sanding medium.

Bullet Casing Pen Tutorial

The steps in finishing the bullet casing for sanding that I use are as follows…..

1. 400 grit
2. 600 grit
3. 1000 grit
4. 1500 grit
5. #0000 steel wool
6. Polishing compound

Having told you this, I realized I forgot to mention something about finishing the copper bullet tip. I try not to mix the sanding and polishing from one metal to another as a rule, but obviously at some point you will have to cross over from one to the other. If you're going to do this, and you will, I recommend going from the brass onto the copper.

Bullet Casing Pen Tutorial

Nickel Plated Casings

If you're going to be using nickel plated casings, sand and polish the bullet tip before you glue them into the casings.

Do Not Sand Nickel Plated Casings

Only polish the nickel plated casings on the buffing wheel.

Once the polishing has been completed the next step is apply a lacquer finish to the completed bullet casing. For this I use Metal Lacquer and Lacquer Thinner mixed 60/40. To begin the process I place dental wax into the bullet tip first, next I place a small hanging fixture into the other end of the bullet casing. The next step is to wipe down the brass casing with straight lacquer thinner and hang the casing on the drying rack. Do not allow direct contact with your skin to the lacquer thinner. Do not touch the clean bullet casings with your bare hands after they have been wiped down. There is a possibility of transferring the natural oils from your skin onto the brass. The small lip of the casing located at the firing cap end of the bullet casings needs special attention during cleaning. If the lip does not get cleaned properly, there is a chance that the lacquer finish will disband from the bullet casing and leave a peeling appearance. People who have a nervous tendency to pick away at this area with their thumbnail will be the first to find it….Seriously!!!!!!!!

Below is a picture of the casing, the hanging fixture, the dental wax and the dipping vessel.

Bullet Casing Pen Tutorial

The dental wax added to the bullet tip by pressing it into the wax.

Bullet Casing Pen Tutorial

The hanging fixture pressed into the end of the bullet casing.

Dipping the bullet casing into the dipping tube.

Bullet Casing Pen Tutorial

A representative picture of what the drying bullet casing would look like. I did not dip this bullet for the tutorial since I normally do a run of bullets with a mixture of lacquer and thinner.

Once I have applied 4-6 coats of lacquer to the casings before final assembly, I then remove the hanging fixture and the dental wax. I then use a refill to check the bullet tip to make sure that no lacquer has built up on the inside of the bullet tip. If it needs to be fixed, this is the last opportunity to do so before assembling the twist mechanism.

The next step is to press the twist mechanism into the bullet casing. For this I have developed a jig that will not scratch or harm the pens finish.

Bullet Casing Pen Tutorial

This is the Bullet Casing Press Die and a brief explanation of how it works. There are 2 wooden die blocks and within the die blocks is a die (2 pieces) that hold the bullet casing during the twist mechanisms insertion. Too many times I have been at this step and ruined the pens finish or damaged the bullet tip. Since I made this die block I have not had any failures.

The empty bullet casing die block.

Bullet Casing Pen Tutorial

The bullet casing loaded into the die block and then assembled for pressing.

Bullet Casing Pen Tutorial

Insert the twist mechanism and we're ready to head to the press.

So let's check to see if the mechanism was pressed in properly by checking the refills location.

Bullet Casing Pen Tutorial

Let’s pull the dies apart and grab the cap for the pen.

Now for the final product.

Bullet Casing Pen Tutorial

I hope I did not put to many folks to sleep because of the length of the tutorial, but I felt a need to be specific about some of the things I have done and about some of the new tools that I have created. If anyone would like more details about the tutorial or the tooling, please feel free to contact me at stickermetimbers@hotmail.com

The last thing I want to add to this tutorial is a Thanks….

To all of my fellow wood turners who have made this hobby so much fun and a place where everyone can share their thoughts and ideas without the day to day issues getting in the way.

David Bell

Bellsy