



NO LATHE TRIKE HUBS

First of all, thanks all of those who visit the Atomic Zombie forum and help others with advice and offer their great tips and tricks. There have been two alternative ideas posted in regards to creating the hub flanges that I use on trikes and quads such as the DeltaWolf, Kyoto Cruiser, Street Fighter, Gladiator, and Lode Runner.

One alternative to the machined disc is to cut the required flat bar or plate using the appropriate sized hole saw. The other alternative is to source out precision made washers of the appropriate size. Often these washers are called "fender washers" or "aircraft washers".

I'd like to present another alternative to the machined discs that only requires the use of an angle grinder, and hand drill. This procedure takes about 2 hours for all four discs, and is very effective if you don't mind spending a little quality time with your angle grinder. Since the hub flanges required in the plans vary in size, I will not be posting measurements here, but the same procedure will work on all trikes that use the hub-axle system I have developed.

ROUGH CUTTING THE DISCS

The flat bar needs to be at least as wide as the discs you plan to make, and the required thickness. This flat bar is very easy to acquire, and can often be found in the welding isle in many hardware stores. You will need enough material for four discs, which is the number of discs needed for a delta trike or quad.

To begin, I traced two of the discs using a paper template that was made in Photoshop and then cut out. The traced circles are the same diameter of the flanges from the original hub because I am using the rim and spokes from a complete wheel that used this hub. The center of the disc must be marked and punched before any cutting, as you do not want to lose this center position. The punched center will later be drilled for the axles. Also, use a marker that can hold up to a little abuse as you will be grinding and handling the discs with gloves.



As shown, the discs being cut from the flat bar using a few straight cuts around the circumference with a zip disc. 8 or more cuts are made just outside the marker line so that final grinding does not take much time.



After a few minutes of cutting with the zip disc, the rough cut part is liberated from the flat. Notice how none of the cuts are inside the marked line.

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My "poor man's lathe" is of course, my angle grinder! If you take your time and work around the discs, it does not take long at all to get them almost perfectly round. I think the angle grinder is like an artist's paint brush - learn to master it, and it can do a lot more than you might think. Since the discs get quite hot while doing this part, I work around half the disc, and then switch it for another one until they are all rounded.



ROUNDING OF THE DISCS

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The disc on the right of the photo has been rounded, and is so close to round that it looks like it was machined. Hey, if a person can carve out a beautiful sculpture from a block of wood using a chainsaw, a skilled garage hacker should be able to make precision parts using an angle grinder!



Once all four discs are rounded and checked to be the same, the edges and mill scale is cleaned up using a flap disc, which is a grinder disc with sandpaper strips attached to it. The discs are now smooth, clean, and perfectly round. The punched centers have also been drilled using a 1/8 drill bit.



Like I said before, I love to work with minimal tools, and do not own a lathe, chop saw, or even a drill press, so I do my drilling in a vice using a hand held drill. To ensure that all four discs have the hole

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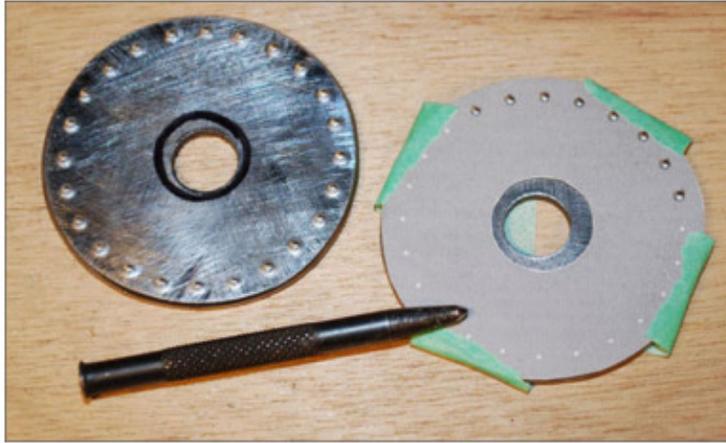
Using a hand drill limits your drill bit size to about 1/2 inch diameter, so the 3/4 inch hole needed for each disc will have to be done using a hand file. This actually works out well since the holes are not perfectly centered as can be seen in the comparison with the hub adapter in the photo. Using the paper template and a round file, the 3/4 holes will be hand filed. This procedure only takes a few minutes per disc but is extremely accurate.



in the same place, I placed them in a vice as shown in the photo so they could all be drilled at the same time. Doing this saves time, and keeps errors to a minimum.

DRILLING AXLE HOLE

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Using a paper template generated in Photoshop or a 3D program, the spoke holes are punched onto the discs for drilling. The axle hole is also traced using a marker so that it can be hand filed to the correct size in the dead center. Notice how much off center the hand drilled 1/2 inch hole is (left of Photo) as compared to the traced axle hole.



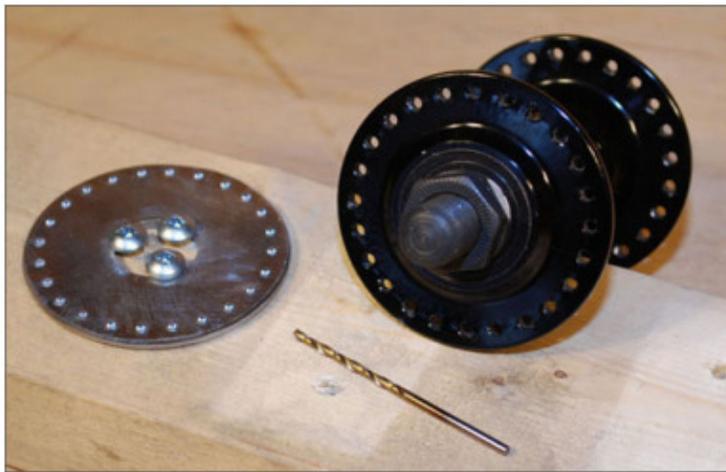
After drilling, the four discs ready to have the centers hand filed to 3/4 inch diameters. The discs are very accurate considering they were carved from a \$3 piece of hardware store flat bar using only a hand held angle grinder!

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A bit of square tubing in the vice makes it easy to use the file to open up the hole to the required axle size. By holding the disc over the tubing, the file can be used up and down on the part, a process which takes about 15 minutes to go from 1/2 inch to the required 3/4 inch size.



An hour later, all 4 discs fit snugly on the 3/4 axle as shown in the photo. The hand filed holes are actually tighter than the last set I had made at the machine shop. Nothing beats old fashioned hard work!



Drilling the spoke holes is another process that is not very difficult to do, but may seem like a lot of work. In reality, the entire process of drilling all 96 holes in the four flanges takes only an hour and can be made a lot easier by bolting down the flanges to a bench top or wood block. If you are lucky, you may not break any drill bits, but it's best to have a few on hand.



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The flanges are bolted to a piece of lumber which is then bolted to the side of my workbench as shown , so that the drill can be held horizontally rather than trying to push down on it. This position is much easier as you can just lean into the drill rather than needing to put constant downward pressure on it. Remember, that drill bit is not very strong, so only a little pressure is used to avoid snapping the bit. I only broke 1 bit during this build!



If you take a close look at a bicycle hub flange, you will notice the spoke holes are beveled slightly. This increases the hole diameter at its opening, reducing the stress on the spoke as it leaves the hole. This is especially important on these drilled steel hub flanges, which would have a very sharp edge on the hole. Spoke damage or the inability to get the spoke into the hole would occur if the beveling was not done. A drill bit at least twice the size of the spoke hole bit is simply pushed into the hole with slight pressure as shown in the photo. This process just bevels the hole opening slightly.



This photo shows the completed beveling of the spoke holes (left side) as compared to the freshly drilled holes (right side). Notice the sharp edges and burs left over from drilling on the unbeveled flange.

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