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Making Trike Hub Flanges Without a Lathe

First of all, I would like to thank all of those who visit our 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 flatbar 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", "dock washers", or "aircraft washers".

I would 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.

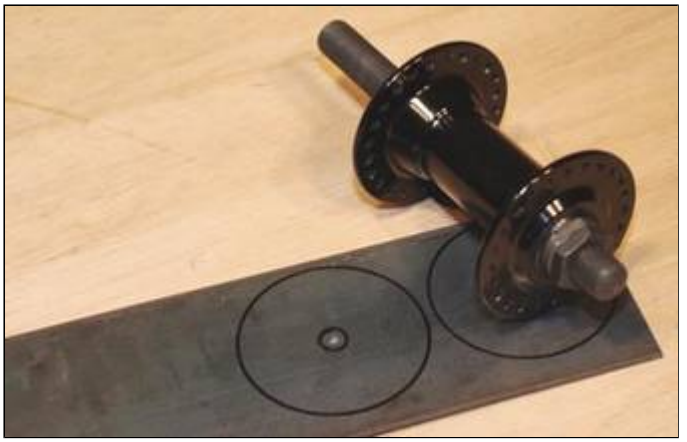

Photo 1 - Marking the flatbar for the disc cutouts
**** All photos can be clicked for a larger view ****

The flatbar needs to be at least as wide as the discs you plan to make, and the required thickness. This flatbar is very easy to acquire, and can often be found in the welding isle in many hardware stores. You will need enough material for 4 discs, which is the number of discs needed for a delta trike or quad. In Photo 1, I have 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 on the hub in Photo 1 because I am using the rim and spokes from a complete wheel that had this hub.

The center of the disc must be marked and punched before any cutting, as you do not want to loose 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.

Photo 2 - Rough cutting the discs with an angle grinder

Photo 2 shown the discs being cut from the flatbar 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.

Photo 3 - Rough cut disc number one

After a few minutes of cutting with the zip disc, the part is liberated from the flatbar as shown in Photo 3. Notice how none of the cuts are inside the marked line.

Photo 4 - Using my "lathe" to make the discs round

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, then switch it for another one until they are all rounded.

Photo 5 - Comparing the round disc

The disc on the right of Photo 5 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!

Photo 6 - All 4 discs rounded and clean

Once all 4 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.

Photo 7 - Drilling all 4 discs at once

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 4 discs have the hole in the same place, I placed them in a vice as shown in Photo 7 so they could all be drilled at the same time. Doing this saves time, and keeps errors to a minimum.

Photo 8 - The hole is only slightly off center

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 Photo 8. 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.

Photo 9 - Discs ready to be hand filed

Photo 9 shows the 4 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 dollar piece of hardware store flatbar using only a hand held angle grinder!

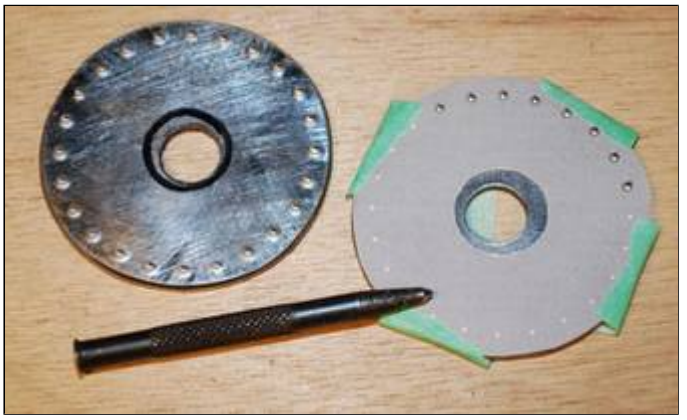

Photo 10 - Punching the spoke holes

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 off center the hand drilled 1/2 inch hole is (left of Photo 10) as compared to the traced axle hole.

Photo 11 - An easy way to use the round file

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.

Photo 12 - Test fitting the discs on the axle

An hour later, all 4 discs fit snugly on the 3/4 axle as shown in Photo 12. The hand filed holes are actually tighter than the last set I had made at the machine shop. Nothing beats old fashioned hard work!

Photo 13 - Getting ready for a lot of drilling

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 4 flanges takes only an hour and can be made a lot easier by bolting down the flanges as shown in Photo 13. if you are lucky, you may not break any drill bits, but best to have a few on hand.

Photo 14 - Horizontal drilling is easier

The flanges are bolted to a piece of lumber which is then bolted to the side of my workbench as shown in Photo14 so that the drill can be held horizontally rather then 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!

Photo 15 - Beveling the spoke holes

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 Photo 15. This process just bevels the hole opening slightly.

Photo 16 - Beveled spoke holes (left)

Photo 16 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.

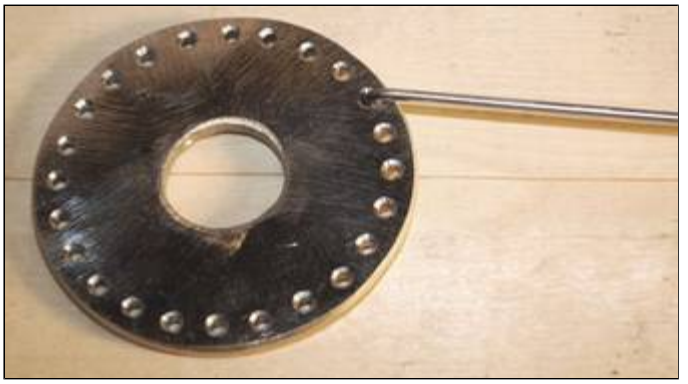

Photo 17 - Testing a spoke in the beveled holes

Without the beveling of the spoke holes, chances are the spoke would not even fit around the bend as shown in Photo 17. Beveling is done on both sides of all 4 discs. The process only takes a few minutes.

Photo 18 - Discs ready to be welded to the axles

Photo 18 shows the completed hub flanges ready to be welded to the axles. Hard to believe that these hand made disc were once nothing but a single length of hardware store flatbar. Who needs a machine shop?!

Photo 19 - Completed trike hub-axle assemblies

Since this small segment is about a hub flange alternative, not any particular vehicle, many steps have been passed to get to what is shown in Photo 19 - the completed hub-axle assemblies. These two parts are ready to have the spokes installed, creating the ultra durable trike or quad rear wheels. Notice how clean the hub-axles look after the face has been cleaned up. Wheel building is a very relaxing and enjoyable task, including useful skills that are easily learned by anyone with a little patience.

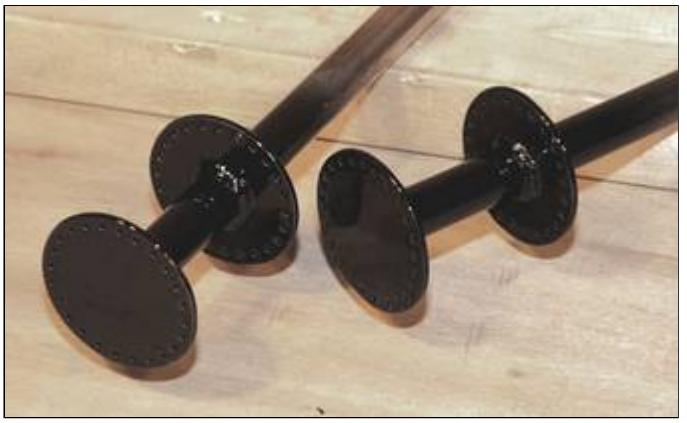

Photo 20 - Painted and ready for rims and spokes

Before the wheel building process begins, the hubs must be painted, as you will not be able to paint them with the spokes installed. Photo 20 shows the end result of about 6 hours of work starting with only a chunk of flatbar. When completed, these trike wheels will be much stronger than all conventional "hub over axle" style trike hubs, and will have cost you much less than custom machined hubs. These hubs also look very professional, as there is no ugly bolt or cotter pin sticking out past the hub face, since the unit is all once piece.

Thanks again for visiting, and hope you will share your ideas and photos with the rest of us garage hackers!