(excerpted from Texas Forge Review, March 2001, article by Hollis Wooldridge)

A Useful Shop Tool…

The reason I love seeing someone like George Dixon is that art and design have always been hard stretches for me and I'm fascinated with what the human mind can conceive with regard to creativity. Fortunately, I've been blessed with a little better understanding of the tool making side of our craft and to that end, I decided to build a cheap but useful belt grinder. Around five years ago, one of our brethren who is adept at scrounging from junkyards scored two motors from some old mainframe hard drives and asked me to help with the construction. I am perfectly ashamed to say that it took several years to get the project finished but the actual design and build time was relatively minimal.

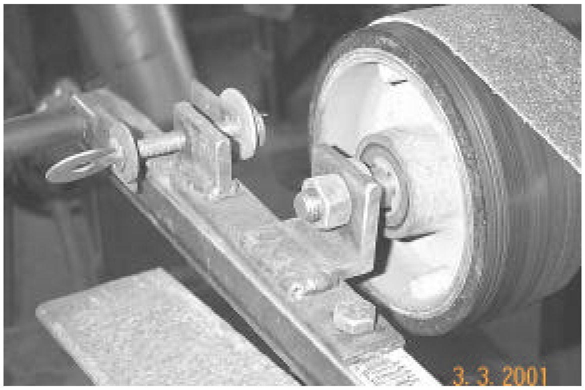
I looked at grinders on the Internet and finally decided on a design that was a blend of several types. This was built to take 2x72 belts like the kind that knife makers prefer. My basic bill of materials is as follows:

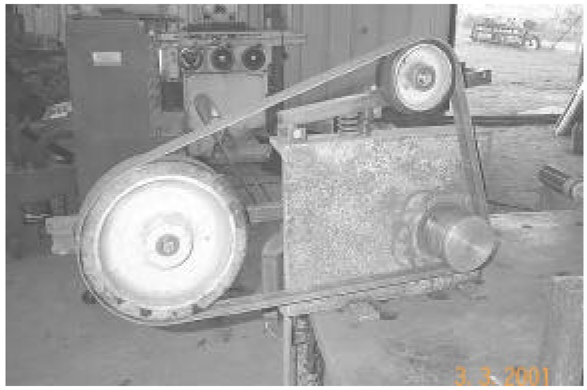
- 1-1/2 hp, 220v, 2850 rpm C-frame motor. A C-frame mounts on its face so an additional mounting method is not needed.
- Sealed bearings from WW Grainger, #SU491, 5/8 bore and 1-3/8 OD. These are standard size bearings with metric nomenclature (go figure…)
- Casters, at least 4" and up to 10" in diameter and 2" wide, with or without bearings (the existing ones will be discarded)
- A piece of 12" to 15" wide channel iron about 18" to 24" long
- 1" square tubing
- 1" square solid
- 5/8" cold rolled round shaft
- 4" diameter aluminum shaft 4-5" long
- Short pieces of misc. angle iron 1"x1/8, 1-1/2x1/4, etc. and similar stock in flat iron (exact size is not important)
- Compression spring 2-4" long

In my research, I discovered that surface feet per minute (SFPM) is important not only to stock removal but also belt life since faster speeds seem to cut better. Posts by various sources indicated that belt speeds between 3000 and 6000 SFPM are the norm. Since I wanted some control and the motors were already available, I calculated that a 4" pulley running at 2850 rpm would yield as follows, pi times diameter times speed divided by 12" or 3.1416x4x2850/12 = 2985 SFPM. If you want more speed, a 3450 motor with 6" pulley will go 5419 SFPM.

It also helps to have a lathe and/or mill to do some of this work. The first step was to flame cut a hole for the drive pulley to fit through and then drill four holes to mount the motor. These motors already had 2-1/2" diameter x 1" wide flat pulleys mounted, so I pressed them off the motor shaft and then bored the 4" aluminum shaft to fit. I then chucked the back of the small pulley in the lathe and took a light cut on the outside of the piece to true it to the bore. This was then remounted to motor. The next step was to bore the casters to receive the bearings (one set per side). I did this in the mill but it could just as easily be performed in the lathe. After boring, the bearings were pressed in flush. At least two casters with bearings are needed – one for the idler and one for the contact wheel. I used a 4" for the idler and a 10" for the contact wheel.

The next part was to make the tracking mechanism. My version is very simple but effective. Two small pieces of angle iron were drilled and welded to the big channel iron to act as a pivot point for the swing arm. I cut a 16" piece of 1" square tubing and drilled a hole at one end so a 5/16" bolt could slip through it and the above mentioned angle iron ears. This is the pivot arm that the idler shaft is ultimately attached to. Two more small pieces of angle iron were drilled and welded to the outside of the square tubing. Between these ears a piece of 1x1/8 flat stock pivots from side to side. A 5/16 machine screw is trapped between the ears and allows the flat bar to traverse left to right on a short threaded section, also welded to the flat bar on the perpendicular. Another piece of angle is welded to the flat to allow the idler shaft to be mounted parallel to the motor. This paragraph is the proverbial 1000 words that the following picture is hopefully worth…





After the bearings are pressed into place, a truing cut is needed on the lathe. At the same time, the idler has a slight crown cut in it to assist tracking. I put 5 degrees per side but this much has a tendency to cup the belt a little and 3 degrees is probably sufficient. The contact wheel should be trued across its face so no vibration is experienced when grinding. Both wheels spin on 5/8 shafts and a groove can be cut on either side of the wheel to hold a snap ring. I have not had a wheel shift in operation but it's cheap insurance.

At this point, we have the frame, a motor ready to mount with drive pulley, an idler, a contact wheel and a tracking mechanism. I used a 1" solid bar to support the contact wheel and a suitable means of holding it must be applied. Back to the small pieces of angle iron and a small box is fabricated and welded to the channel iron to encapsulate the arm with a lock bolt affixing it in position. The contact wheel slides back and forth on its arm to allow for the coarse setting and the compression spring can be placed somewhere under the pivot arm to apply tension to the belt. In my case, I installed a double pole, double throw switch to activate the motor since it was 220v.

The first grinder took about 30 hours because I was designing as I went but the second was finished in less than 12 hours. The entire out of pocket cost using the scrap motors was around $100 for both grinders. The best thing I've found is how fast a knife or ax can be sharpened on the slack part of the belt. I've bought several belts and intend to build a good belt knife to use in the hunting camp. The other uses for a grinder like this are myriad and I think my next version will be capable of 6000 SFPM.