What I did differently to Phil Vandelay's belt grinder design

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Link to Phil's YouTube playlist for his belt grinder: https://youtu.be/gaIVzdJ2V5w
And his excellent plans for his (metric) 75x2000mm grinder: https://www.etsy.com/listing/823825577

When making my "imperialized" 2x72 inch belt grinder while still closely following his plans, I made a number of changes, which I list below. I want to point out that many of my changes are just that: *changes*. They're not necessarily *improvements*. You can judge the merit of each for yourself if making your own grinder.

I went through the **bold** items listed below in my own YouTube video "**Belt grinder part 10**" where I wrap up my belt grinder series. My playlist begins at https://youtu.be/qwXoZ3xxnT8

Major changes

1. **Imperial 2x72" rather than Phil's metric 75x2000mm (about 3x79")**
   - and imperial ½ and ¾ inch steel rather than mm sizes in Phil's
2. Which means some **geometry changes/shortening and smaller wheels** to suit the **7" shorter belt**
   - sketched up in Fusion 360 to figure it out
   - smaller 6.25,4,2,2 wheels; 2" wide rather than 3"
   - platen wheels 1" closer together (but platen length at 11" is about the same, as I left very little clearance between the platen and the platen wheels, whereas Phil left about ½ inch either side)
   - main plate about 2" shorter
   - tensioner wheel rises slightly less than Phil's
3. **Used a close tolerance dovetail instead of slot** for tensioning arm
   - And the arm is 2-3" longer than Phil's, extending past bottom of main plate, so that it's still fully engaged in the dovetail when the tensioner wheel is at its tallest position
4. My **tensioner adjustment arm applies pressure on the gas strut** rather than releasing pressure
   - And made from bending metal (and welding a "sister"piece of metal to double thickness through the hub area for strength) rather than machining
5. Platen considerably wider, with **notches for 90, 45, 30, 22.5. 15 degrees**; notches labeled
6. The **horizontal/vertical pivot is at the rear of the sleeve instead of at the top**.
   - Makes balance better in horizontal position
   - Provides higher ground clearance for the motor in the horizontal position

7. **Stand is completely different**
   - Shorter, stronger, and simpler to make
   - Stand pivot axles are hardened ½ bolts through bronze bushings
   - Instead of a lever clamp for horizontal/vertical, my stand uses a spring plunger into ¼ inch flange. Solid and secure.
8. Uses a **ceramic glass plate** for a very hard platen face (rather than heat-treating the steel one)
9. **Table horizontal rod is longer, and table clamped at extreme left end**; allows the table to serve both horizontal and vertical positions without having to swap rod direction (tho' still possible).
10. Rounded top of table vertical attachment arm provides **flat support for table bottom** in vertical position
11. Brass **"safety stop" knobs** added to table rods so the bracket can't fall off the end

<u>Minor changes</u>

1. Mix of metric and imperial hardware – used what I had and what made sense
2. Decorative cutouts in platen, pivot bracket. Decorative brass handles/knobs. Chamfers everywhere.
3. My attachment arm sleeve rear plate is bolted in from top and bottom rather than from end
   - Not an improvement; just did it my way 'coz that worked out with the leftover metal sizes I had
   - But worked out when changing to rear position for pivot, so that brackets can use same top screws, and no interference from rear screws ('coz there are none)
4. Platen attachment arm is 2x2 square tubing rather than solid bar … with a solid bar insert at the end
   - The indent/groove/slot doesn't go all the way to the end; used to limit outward travel (can't fall out accidentally)
5. Table attachment arm is 1.5" round … beefier than Phil's
6. Used off-the-shelf wheels from eBay (6.25" drive; 4" tensioner; 2" platen wheels) rather than machining my own. I figured the aluminum slugs would cost more than the pre-made set (which also include installed bearings)
7. Different style of tensioner arm wheel pivot bracket, with integrated hub for the wheel spacing, and leaving a "top cap" for extra strength. And used a 10mm shoulder bolt for pivot (rather than fully threaded) for a tight swivel
8. Big 12mm threaded rod for tensioner adjustment
   - No need to be this big; I just had a suitable short length of 12mm threaded rod hanging around
9. Six screws instead of four to hold main clamping rod to attachment arm
   - Again no need; I just think it looks better.
10. **Larger and more tightening levers and ball plungers** throughout. I "up-sized" all of the levers and ball plungers. I also added a second lever to the main table rod clamp, an extra (3rd) ball plunger to that clamp, and an extra (2nd) ball plunger to the table support bracket
11. Simple ½ inch hardened bolt with shoulder used for platen axel (Phil makes a custom axle). Likewise ½ inch hardened bolts used for tracking and platen axles rather than custom made
12. The **T-slots in my table match the dimensions and thread size of my mill table**, so that I can use the same hold-down hardware and jigs on both. And they're **retained by levers** on each end of the table, clamping them in place.
13. The grooves for the ball plungers don't go all the way to the end of the rods, so the balls will help to keep the brackets from falling off the ends.

14. Similarly the slot for the main (square) attachment arm doesn't go all the way to the end, so it can't fall out. (Need to unscrew the lever a few more turns.)

What I'd do better if I were to re-make it

1. Already fixed/re-made this issue: Make sure the dovetail for tensioner arm is a close fit.
2. When pounding the square rod into end of the main attachment arm 2x2, make it longer and go deeper into the square tube so that it includes the adjustment arm clamp area thread. And weld those parts together after cutting the 45 but before machining, so they'd look all one piece.
3. I wish I'd bought a **motor with a longer drive shaft** (they're available) for better clamping of the wheel, and to allow wheel to space out another ½ inch from frame.
4. When tensioner lever is released fully while the grinder is adjusted for most flat-out 15 degree position, the **bottom of the lever slightly contacts the belt**. Could be avoided by moving the lever pivot point a little higher, OR by moving the wheels ½ inch further away from the main plate – which would require the longer motor drive shaft.
5. We **don't need a separate tension position hole for each of the 5 positions**. 2-3 key positions would do, as the gas strut has plenty of up/down movement to compensate.
6. The holes drilled in the main plate for the pivot bracket (in Phil's design; I use them instead for strengthening arm brackets) should've been aligned with the bolts holding the sleeve. They're ¼ inch or so displaced. Aligning would look nicer and be less troublesome when locating the mating part holes.
7. I **should've made a simple jig to accommodate a transfer punch** for the centers of the spring plungers (rather than using the Prussian blue technique). Would've been faster and more accurate center punches.
8. I could've cut decorative slots in the positioning flange on the mill before welding it to the base.
9. **Always leave chamfering until the very end of a part's creation**. Having chamfers early on can be a problem with putting the parts back into the mill vise on parallel bars, as the bars might rest only on the chamfers. Also, you can't clamp it just "thinly" near the bottom of the part if it has chamfers.
10. Dumb that I left a hole in the end of the positioning lever brass handle. Should've drilled/tapped that end as a blind hole and put the chamfer feature on the other end.
11. Stupidly overshot the 1" hole in the table attachment bracket, to 1.008". I'd used boring head in mill instead of easier and more accurate boring bar in lathe – with a 4-jaw chuck to hold the dialed-in part. (To compensate, I re-made the table attachment arm from 1 1/8 round rod, turned down to 1.008.)
12. Stupid that I mounted both table rods into the 90-degree bracket before grinding the grooves for the ball plungers. Seemed like a good idea at the time, to ensure proper squareness. Was a pain with the 90-degree rods to fit into the mill. ONE mounted would be fine.
13. I broke a 4mm tap when threading the screw that forms the stop for the little lever that holds in the T-nut on the table. After unsuccessfully trying to remove the broken tap, I decided to TIG weld a little "knob" for the stop on that side, and grind/file it down to shape. I actually like that more than the screw, but it was a lot more work, so I didn't do it to the other table lever, yet.

14. Should delay cutting the slot into the main (square) attachment arm until all the geometry is figured out. Then cut it only as long as necessary to allow just enough sliding end to end. Similarly the ball-end grooves in the table attachment rods should be cut only as long as necessary.
15. The **table vertical rod should be 2" longer** so that the table can rise up and over the belt when the platen frame is "laid out" in its maximum 15 degree position.
    Note: I made it as long as possible so that, in its lowest position, the bottom of the rod would still be clear of top of the table that the stand is mounted to. But in all/most practical mounting uses, the table will hang out from the tabletop anyway, so the vertical rod can be as long as you want. My only real concern is ensuring that the cabinet drawers can still open fully without striking the rod.