Crushgrind Pepper Grinders
Order of Work

JLD Woodruff
March 11, 2019

Drilling and Turning the Pepper Grinder

1) Blank 3"x18" Body will be 10" Head will be 4".
2) Glue additional plastic washer on head grinder mechanism with special plastics glue.
3) Mark centers on top of Head and bottom of Body, from all four sides, and punch them with awl.
4) Mount blank on lathe, steb center (with teeth) in Headstock, live center in tailstock. Head is in Headstock Body in tailstock and rough round.
5) Cut 3/8" tenon on bottom of Body, Mark 10" from top of tenon, then mark and cut 3/8" groove for cut off between Body and Head. Cut a tenon, then mark 4" from top of this tenon for top of Head and cut 3/8" tenon on top of Head.
6) Mark Body top and bottom, Head top and bottom. Head top is in headstock.
7) Part Head and Body down to 1/2" with gentle undercut to Body and Head. This undercut is critical for final fit. Saw off Body and clean up saw offs.
8) Mark centers on Head bottom and Body top, three intersecting lines, and punch with awl.
9) Mount Head top in Headstock with the chuck and live center in tailstock. Mark 1 chuck jaw # on Head top waste for remount later. True up if necessary.
10) In Head, start with a small bit pilot hole and then drill a 15/16" hole with a Forstner bit 2 ½" deep.
11) Retighten chuck. Mount live center in tailstock to support bottom of Head.
12) Shape Head and sand with 60 grit, top 2 5/8", bottom 2 1/8". Cut top tenon to ½" gently rounding top of Head. Do not cut off the Head yet. Make the Head bottom exactly 2 1/8" as this is critical for final fit.
13) Mount bottom of Body tenon in headstock chuck, live center in tailstock and true up body if necessary.
14) Put WD 40 on 1" augur bit tip. Drill Body from the top, starting with a small drill bit pilot hole to center the Augur bit and cutting to 6 ½" from top of Body. Check chuck tightness part way through. Use WD40 often.
15) Flip Body so Body top in is the chuck, live center in tailstock check that Body is turning true if not true up. Chuck teeth will mar Body but will sand out.
16) Drill Body from bottom starting with a small bit pilot hole then with 1 ¾" Forstner bit 11/2" deep. When past the top of the tenon bottom, cut off tenon with undercut on Body bottom. Sand body bottom and inside to final.
17) Check chuck tightness. Save various colors of sawdust separately for later repairs.
18) Drill Body from bottom with 1 9/16" (40mm) Forstner bit all the way through until it meets the hole previously drilled from the top of the Body. If not through use augur bit from bottom of body to complete the hole.
19) Mount Body top in Headstock with jam chuck and support Body bottom with live center in tailstock, check that Body is turning true if not true up.
20) Shape Body and sand with 60 grit, top 2 1/8", bottom 2 5/8". Make the Body top exactly 2 1/8" as this is critical for final fit. Dismount the Body. Test fit body and head with grinder mechanism. If fit is imperfect check undercut area for problems and clean up with Dremel tool, keeping away from inner and outer edges.
21) Remount Head in Headstock chuck, join Head and Body with jam chuck, support Body with large live center in Tailstock.
22) Finish sand Head and Body together using 60 grit if needed to get the joint even, then lightly sand through the grits from 100 to 320. Do very light sanding above 60 grit as heavy sanding will put the Body out of round. Remove the Body. Cut off head and finish sand top with orbital sander.
23) Test fit Head and Body with the grinder mechanism.
24) Hand sand body and head, with the grain, using 320 grit, to remove all marks. Fill any flaws with superglue and rub sawdust of the appropriate color on top of the superglue. Re-sand until smooth.
25) Glue grinder mechanisms into Head and Body with epoxy. Fit Body and Head together when glue is wet and duct tape them while glue dries so they are perfectly aligned.
26) Finish Head and Body separately with varnish ensure it does not interfere with Head and Body meeting perfectly.

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Making the 3”x3”x18” Blanks

In Costa Rica lumber is sold using varas and pulgadas. A vara is an old Spanish measure of length which varies by country but in Costa Rica is 83.67cm or 33”. Lumber is sold in lengths of 4 varas or 3.35 meters or 11’. It is measured and priced in pulgadas which = 1”. So pricing is based on lumber of 1”x1”x11’.

In selecting rough lumber start with one standard 4 vara length of 11’ by 7 inches. Thickness is not important but generally 1 ¼” 1 3/8” is a good size.

1) On the compound miter saw, cut the board into three pieces of about 1.1 meters or 43”
2) On the planer, plane both sides smooth, generally yielding 1” thickness
3) On the jointer, joint one edge
4) On the tablesaw, cut each board to 3 1/8” with the jointed edge against the fence
5) On the compound miter saw, cut each board to yield 2 pieces 18” long, 6 pieces in total
6) I generally do six pepper grinders at a time. This uses 6 pieces each of nazarena (purpleheart), amerilion (a hard yellow wood shot with red), ron ron (a hard dark brown wood shot with black) or crystobal (a hard orange wood), and manglia (a medium hard wood varying from white to pink and generally only 3/8” thick as it is used for ceilings in Costa Rica and comes pre-cut as tongue and groove).
7) Sort the 4 types of wood so that one of each is used in the pepper grinder blank. To yield a blank about 3” x 3”. I generally put the nazarena on the outside on one side and the amerilion on the outside of the other side as they will ultimately end up in the middle of the pepper grinder.
8) First glue up consists of gluing the six blanks together at the same time. Ensure all faces are smooth and free of dust or other particles. Spread glue on each face so that all glued faces have had glue applied to them using a small 4” paint roller. The glue we use is an outdoor glue sold in Costa Rica called Lanco Gripbond 4. Using 4 pieces of specially made stainless steel square pieces 1”x3”x1 meter clamp the six blanks at the same time with pipe clamps below and on top of the glued pieces. Look for glue squeeze out on all joints. You may have to use a hammer to force the blanks to stay aligned as they tend to sheer up or down when pressure is applied. Glue sets in a few hours or overnight.
9) Remove glued blanks and run them through the planer to even up the tops and bottoms and remove glue squeeze out.
10) With the side showing the 4 separate pieces up, draw a line from the top right corner to the bottom left corner. On the bandsaw, but the blank in half along the line. On the belt sander roughly even out the bandsaw cut sides of the blank so pressure can be roughly evenly applied on the second glue up.
11) Sand the two sides to be glued together to remove particles, dried glue etc.
12) Second glue up consists of flipping the two parts of the blank so that it is back to 3”x3” but with the 4 pieces of wood now showing as a set of diagonal lines instead of a set of straight lines. Glue up the two-piece blanks using the same procedure as for the first glue up. The sheer tendency is much worse in the second glue up. It helps to put a piece of wood up against the stainless-steel square pieces where the thing edges of the blanks meet the thick edges, but also takes some hammering. Add clamps as necessary to force glue squeeze out all along the joints of the blanks.
13) Remove blanks from second glue up, run them through the planer to even up the sides and remove glue squeeze out.
14) On the compound miter saw, cut off the ends of the blanks removing as little material as possible.
15) Final blanks will be approximately 3”x3” x 18”. As the final pepper grinders are 2 5/8” x 14” these blanks will require lathe work to remove material

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Principles

1) Blank must be carefully centered on all four sides (since it will not be an exact square) top and bottom and turned between two centers to a cylinder
2) Holes are cut in the Head and Body separately and both are trued up as cylinders centering and aligning the holes with the outside of the cylinder before shaping begins
3) Holes will never be centered so they are drilled first in the rough cylinder and shaping is done second, around the holes. Shaping effectively centers the holes, rather than trying to drill holes in the center of the shaped pieces
4) Drill Body holes from both ends to get the holes near the center of the rough cylinder and because if the holes don't meet exactly in the middle of the Body it won't matter
5) Use 3/8" tenons on ends opposite where drilling occurs to aid stability and centering while drilling (Head top, Body bottom)
6) Drill on lathe. Only drill out the center of the Body on the drill press
7) Jam chucks and live centers are used after each hole is drilled and tenon cut off to allow truing up of the blank, aligning the outside
8) Drilling is done at the slowest speed possible
9) Sanding is done at a high speed
10) There are three critical places in the process which must be exact. Step 7 undercutting the Head bottom and Body top with care and exactly down to ¾ - ½ inch and smooth as possible with a gentle undercut; Step 12 make the Head bottom exactly 2 1/8"; Step 20 make the Body top exactly 2 1/8".

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