Turning a Ten Inch Peppermill

Bill Pottorf

I. Mill Mechanisms.

A. Several available sizes but I use 10" deluxe peppermill mechanism made by Chef Specialty.

B. Suppliers

1. www.woodturnerscatalog.com
2. www.pacardwoodworks.com

C. Have used other mills but grinding mechanisms not as good.

II. Making the blank.

A. Wood to use.

1. Should be kiln dried and straight grained.
2. Wet woods or curly grained woods can add error in drilling operation.
3. Harder woods such as Maple, Walnut or Mahogany offer better longevity for the mill.

B. Size of the blank.

1. Square blank should be 3-1/8 inch square by 12 inches long.
   a. I shoot for 3-¼ inch square by 12 inch long.
   b. Segmented splines make a good-looking mill.
   c. Diagonal laminations present a grain match problem between base & top.
2. Component length summary for a 10" mill.
   a. ***10-1/8 " finished length of mill base and "exposed" mill grinding knob***.
   b. ½ " long by 1" diameter mill tenon on base of knob.
   c. 1 " for (3) 5/16 " dovetail tenons (2 on base and 1 on top of mill knob).
   d. 1/8 " for parting cut between base and mill top.
   e. 11-3/4 " for above yields ¼ " of spare length in a 12 " long blank.

III. Design the profile of your mill.

A. Draw mill profiles you desire on paper.

1. Start with cylinder 3" diameter by 10 1/8" long mill requirement.
2. Decide on the base height and your desired profile at bottom of cylinder.
3. Draw the mill-grinding knob at top of cylinder without internal 1" tenon.
4. Keep the flat matching surface between base & knob the same diameter.

B. Story Stick is invaluable for matching dimensions between multiple mills (salt & pepper).

1. Mark profile lengths & diameters @ appropriate locations on 12" stick.
2. Keep base profile on left end and move grinding knob to far right end.

3. Mark all dovetail tenons and profile locations for mill base.
4. Mark mill grinding knob 1" diameter tenon, knob profile & dovetail tenon.
5. All extra space will be located between the mill base & top positions.

IV. Turn the log blank.

A. Accurately mark and dimple log centers on either end.
B. Turn 3" plus round log between centers.
    1. Use 7/8 or 1 ¼" Steb Center in headstock and revolving center in tailstock.
    2. Round log should not be turned to final maximum profile diameter yet.
    3. Best to use a skew but spindle or detailing gouge will also work.
    4. Achieve a constant oversized cylinder diameter for the log.
    5. Sand to 120 grit if necessary.

V. Use "*Story Stick*" to add locations of key mill profile components and diameters.

A. Mark mill base on left end of blank.
    1. Mill base has 2 7/8" diameter x 5/16" dovetail tenons on each end.
    2. Mark desired profile locations & diameters between dovetail tenons.
B. Mark mill top on right end of blank.
    1. Mill top has 2 7/8" diameter x 5/16" dovetail tenon on top.
    2. Mill top has a 1" diameter x ½" straight mill tenon on bottom.
    3. Length of mill top between tenons will be 10 1/8" minus base height (measure accurately).
C. Parting zone will fall between mill base dovetail tenon and bottom of 1" diameter mill top tenon.
D. Assure that final exposed mill base and top w/o tenons will be 10 1/8".

VI. Part mill base and top for drilling and profiling.

A. Turn the 2 7/8" diameter x 5/16" dovetail tenons on each end of 12" round log.
    1. Use 4-jaw chuck with jaws as close to 2 7/8" diameter when closed as possible.
    2. Dovetail needs to exceed 1 5/8" diameter of counter bore in base of mill.
    3. Assure good dovetail surfaces with ***flat*** mill bottom to seat jaws.
B. Remove Steb Center and mount 4 jaw chuck for parting operation.
    1. Use appropriate dovetail jaws for tenon.
    2. Accurately mount marked mill base in 4-jaw chuck.
    3. Drill ¼" hole partially through mill top on opposing end to save later steps.
        a. Use ¼" diameter bit to bore ½ way through mill top.
        b. ***DO NOT BORE INTO THE LOWER PART OF THE MILL TOP.***
        c. This will properly center the top hole for alignment later.
C. Part mill top from mill base.
    1. Remove stock in parting area and 1" diameter mill top tenon to about 1 1/8" diameter.
        a. Use 1/8 parting tool or a Bedan works best.
        b. ***DO NOT OVERLAP INTO THE MILL BASE DOVETAIL AREA***.
        c. Parting area is between 5/16" dovetail tenon for base and bottom end of 1" diameter tenon of the mill top.
        d. Leave the 1" diameter tenon at 1 1/8 " diameter for now.
    2. Part off the mill top using a 1/8" or less parting tool.
D. Complete turning mill base upper dovetail 2 7/8" diameter x 5/16" tenon.
    1. Clean up end of parting area on mill base.
    2. Maintain the accurate 5/16" thickness for the dovetail (a mistake causes later problems in the ultimate fitting of the mill mechanism).
    3. Assure good dovetail surfaces with ***flat*** mill bottom to seat jaws.

VII. Drilling 10-inch mill base and top.

A. Necessary drilling tools used in ½" Jacobs Chuck in tailstock.
    1. 1 5/8" diameter forstner bit.
    2. 1 1/16" diameter forstner bit.
    3. 1 " diameter brad point or forstner bit with extension.
    4. 7/8" diameter forstner bit.
    5. ¼" diameter brad point or regular drill bit.

B. Drill the mill base
    1. Re-chuck mill base upper dovetail tenon in 4-jaw chuck with bottom facing tailstock.
        a. Use 1 5/8" forstner to bore out tenon + 3/8" into mill base or 11/16 " total.
        b. Use 1 1/16" forstner to bore an additional ½" into mill base or 1 3/16" total.
        c. Use 1" diameter brad point bit to bore at least 3/4 of the length of the base.
    2. Re-chuck mill base lower dovetail tenon in 4-jaw chuck with top facing tailstock.
        a. Use 1" diameter brad point bit to bore to pre-existing hole depth.
        b. This procedure assures proper alignment of mill bore.
        c. Remove upper 5/16" dovetail tenon.
    3. Remove mill base from chuck.

C. Drill and complete mill top.
    1. Re-chuck the mill top by the 2 7/8" diameter 5/16" dovetail tenon.
        a. Use original 4-jaw chuck as before.
        b. Reduce 1 1/8"diameter tenon to 1" diameter using Bedan or Skew tool.
            - Measure 1 " diameter using 1" open-end wrench.
            - 1" diameter needs to be full for fitting in a 1" jam chuck.
            - Length of tenon is ½ inch.
        c. Use 7/8" diameter forstner bit in tailstock to bore 1/8" counter bore in 1" tenon.
            - This is for fitting and centering the drive plate for the mill shaft.
        d. Use ¼" diameter bit to bore mill top to pre-existing bored hole.
    2. Remove mill top from chuck.

VIII. Spindle turning desired mill profile.

A. Apply good spindle turning procedures.
    1. Pre-set cove diameters using 1/8 parting tool.
    2. Use skew or detailing gouge to define beads and cut coves.
    3. Apply rolling technique with body and tool for smooth cuts.
    4. Cut grain fibers downhill not uphill, i.e., from largest to smallest diameter to avoid grain-tear-out.
    5. Aim for smooth cutting results with minimal tool marks.
    6. Practice technique on scrap if necessary, to produce good mill results.

B. Turn mill base profile.
    1. Prepare jam chuck for mill base.
        a. Expansion mandrel type – Ernie Connover, "Useful Woodturning Projects", GMC Publications, 1995, pp 104-107.
        b. Jam chuck for mill base 1 5/8" counter bore –
            - "Pepper Mill" – Nick Cook, "American Woodturner" Vol. 19 No. 1, pp 45-47.
            - "Laminated Peppermill" – David Campbell, "Woodturning Design" Spring 2006, pp 8-13.
    2. Remove dovetail tenon @ bottom of mill base.
        a. Use 1" diameter mandrel chuck to hold mill top at headstock.
        b. Use revolving center cone in tailstock to center base of mill.
        c. Use skew of detail gouge to remove dovetail tenon.
        d. Assure good flat surface at base of mill.
        e. Do not remove any mill stock length in this step!
    3. Spindle turn desired profile on mill base.
        a. Complete turning cylinder to final profile diameter.
            - Jam chuck mill bottom at headstock.
            - Use revolving cone on tailstock for centering 1" borehole.
            - Use skew to achieve final maximum profile diameter.
            - Assure that mill base planned length is retained.
        b. Re-mark profile components and diameter locations if necessary.
            - Use "story stick".
            - Also mark the desired diameter for common mill turning surface (this diameter must match on mill base and mill top).

c. Turn the base profile.
- Use 1/8" parting tool to define depth to cove diameters at the locations.
- Turn the upper bevel to the marked common surface diameter with detail gouge.
- Turn any bead boundaries using skew with long point down.
- Complete turning the profile of the mill.

d. Minor sanding can be performed up to 120 grit at this time to remove any tool marks.

C. Turn mill top profile

1. Prepare jam chuck for mill top from Maple or Poplar.
   a. Jam chuck will be made by hand boring (fitting) 1" hole to hold mill top tenon.
   b. Jam chuck should have a bevel to replicate diameter of mill base common surface and is used to control the shaping of the mill top common surface diameter.
   c. Add a tenon to rear of jam chuck to be held in a 4-jaw chuck.
2. Remove dovetail tenon from mill top.
   a. Insert 1" diameter tenon of mill top in jam chuck.
   b. Centering mill top done with revolving cone in tailstock.
   c. Remove dovetail tenon ***without overlapping into the mill top***.
   d. Do not remove any overall mill stock length in the step!
3. Spindle turn desired profile on mill top.
   a. Complete turning top cylinder to final profile diameter.
   b. Re-mark profile components and diameter locations.
      - A small flat surface should be retained at the top for the mill nut.
      - The beveled jam chuck for turning should define the common surface at the base of the mill top.
   c. Turn the top profile.
      - Use detail gouge or skew to turn from maximum to minimum diameters.
      - ***Do not turn uphill to avoid tear- out***!
      - Turn mill top with smooth even rotating movements
   d. Minor sanding can be performed up to 120 grit at this time to remove tool marks.

IX. Final sanding and finishing.

A. Mount mill base and top on mandrel or jam chuck.
   1. Check fit of mill top on mill base.
   2. Correct any fitting errors necessary.

C. Sand components through 400 grit with sanding sealer between coats.

D. Apply finish of your choice to only the outside.
   1. I use 3 coats of Waterlox followed by Beall Buffing.

X. Assemble Mill.

A. Place driving plate into 7/8" counter bore in mill top.
   1. Pre-drill screw holes in mill top.
   2. Insert screws into top to hold drive plate.

C. Place lower grinding mechanism into 1 5/8" counter bore.
   1. Pre-drill screw holes in mill base.
   2. Insert screws into base to hold grinding mechanism.

D. Assemble grinding shaft through the drive plate in mill top and add knurled nut.
   1. Should knurled nut not tighten fully on mill top – then
      a. Disassemble grinding mechanism.
      b. Cut off 1 – 2 threads on shaft to allow knurled nut to seat.
      c. This was caused by too much of the mill length reduced to less than 10 1/8".
      d. That was the reason for the warnings above.

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Have fun turning your mill!