Notes for Making a Pepper (or Salt) Mill with some considerations for using a mini-lathe

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Stainless Steel mechanisms for Pepper and Ceramic Mechanisms for Salt or other spices are available from Chef Specialties in PA, as well as the usual woodturning suppliers such as Woodcraft, Rockler, Craft Supply, and others. Chef Specialties probably have the most complete range of sizes of this type of mechanism, listed on their web site at:

http://chefspecialties.com/catalog/index.php/cPath/18

These instructions have been developed with some specific considerations for making about an 8" pepper mill on a mini-lathe, using only a basic chuck with #2 jaws. With a few modifications, a somewhat longer mill can be turned on a mini-lathe. The notes also discuss options with a lathe with a longer bed length, and options if you have spigot jaws for your chuck. Also, these instructions include suggestions for making a pepper mill without any special size drill bits or even any Forstner bits. It can be done with just a 1" spade drill if you are careful.

1. Note, it's a bit easier if the blank is about 1/2" longer than the kit, to allow for the tenon at the top and parting off the two pieces. Mark the centers of each end and mount between centers. It is relatively easy to modify the shaft from the kit to make it shorter if necessary, but with a bit of planning, it's easy to get the overall length to match the stem supplied in your particular kit.
2. Orient the wood blank so that the top of the finished mill is at the headstock end.
3. Rough turn to a cylinder, keeping it about 2-3/4" diameter, and make a tenon on the top, sized to be gripped in the #2 jaws of a chuck, which is likely to be close to 1-3/4" dia. If you have a chuck with spigot jaws, then you have more flexibility with the overall design, and you might well want to make a smaller (or larger) mill.
4. Chuck the blank with the tenon, and support with a live center in the tail stock. True the blank to be round, and face off about 1/2" of the bottom to be flat or slightly concave, so that the mill will stand straight on a table when completed, and not rock.
5. If you only have #2 jaws on your chuck, drill the bottom of the blank with 2-1/8" Forstner bit (based on the diameter of your #2 jaws when they are closed, to a depth of at least ¼" (slightly over half the thickness of the drill), but this is not a critical dimension. However, the overall length of the completed mill, which is determined by the length of the "stem" piece in the kit, will be influenced by this depth. Alternatively, if you do not have this large Forstner bit, you can drill the hole in the next step, and then open up the recess using a gouge and/or scraper as described in this step. This initial hole needs to be at least 1-5/8" to fit the Chef Specialties mechanism, and you can use that size if you have spigot jaws for your chuck.
6. Drill into the bottom of the blank about 2-3" (or up to half of the length of the bottom of the mill) with the 1-1/16" Forstner bit. Alternatively, if you do not have this size Forstner bit, you can drill 1" and then carefully open the hole for about 1" deep to be 1-1/16" which is required for the mill mechanism. Alternatively, you can just use a 1" spade drill, or grind a 1-1/8" spade drill down to be 1-1/16". Break the edge of the corner of the central hole.
7. Make sure the drilled surfaces are cleaned off and sanded as needed.
8. Support the bottom of the blank with a cone center and make the tenon for the top to be slightly larger than 1-3/4" or as appropriate for the design of your mill (typically up to 1/3 top and 2/3's bottom). The tenon should be about ¼" width minimum length. NOTE: The tenon needs to be sized according to your overall design. It can be as small as 7/8" for a real small pepper mill, but around 1-3/4" is a convenient size for most designs and it facilitates easier filling with peppercorns than with a smaller tenon.

9. Part off the two pieces, at the bottom of the tenon, using the thin parting tool. Stop with about ¼" - ½" remaining and complete with the trim saw.
10. With the top still held in the chuck, drill a 7/8" diameter about 1/8" deep recess to receive the top drive plate. Alternatively, you could drill the hole in the next step and then open the recess with a scraper. Check the fit of the drive plate, because you might need to open the drilled recess a small amount with a skew if the drive plate doesn't slip into the drilled hole. NOTE: This 7/8" dia is the absolute minimum size of the tenon, if you are trying to make an unusually small mill.
11. Drill a 5/16" hole through the length of the top. Woodcraft instructions call for ¼" hole, which works, but I prefer a bit more clearance. The diagonal cross-section of the shaft measures 0.250" so things have to be lined up "just right" with a ¼" hole. This finishes drilling the top, so mark the #1 jaws and remove it from the chuck.
12. Mark the center of the top of the bottom, then reverse and mount the bottom of the bottom in the chuck, using an expansion grip into the 2-1/8 recess. Be careful to not apply too much pressure as you can split the bottom of the piece. It is helpful to support the "top of the bottom" in the live center while mounting in the chuck, to be sure to get the piece centered as much as possible.
13. Drill 1-3/4" (or whatever size tenon you want) slightly deeper than the tenon width created in Step #6. Note, your particular design might dictate a different size for the tenon and opening, and the 1-3/4 can be drilled deeper to provide a larger reservoir for peppercorns or sea salt. You can bevel the bottom of the tenon to make a slope that helps the pepper or salt to slide down into the reservoir. This can influence the outside shape you can have on the mill however.
14. Drill 1-1/8" (or any desired size for the reservoir) through the remaining part of the bottom body piece, to meet the hole drilled in Step #5. This drill can be larger, for a larger reservoir of peppercorns, up to the size of the opening in the previous step. This is part of the design considerations.
15. Clean all of the surfaces, and (optionally) bevel the bottom of the "step" into the 1-1/8" hole. Sand the surfaces if necessary.
16. Rechuck the top with the tenon and center the bottom with a cone center while tightening the chuck.
17. Make the final sizing cut on the tenon to fit the hole drilled in Step #10.
18. Place the bottom part on the tenon and support the bottom with the cone center. Mark the key diameters with a pencil and then use a parting tool to locate the minimum diameters and also the overall top of the mill (based on the discussion about overall length in the class/demo).
19. Turn the desired profile design into the mill, sand as necessary and apply the desired finish.
20. Drill pilot holes (preferably using a drill press if available) for the four mounting screws (two on the bottom mechanism and two for the top plate) and install the mechanism following the supplier's instructions.

Other considerations:

1. You can drill or turn the recess in Step #4 to be as small as 1-5/8", if you have spigot jaws for your chuck or some other means to hold the bottom of the mill so that you can drill from the top of the bottom. You could grip the outside diameter in a chuck with suitable jaws.
2. The minimum size of the tenon for the top is 7/8", equal to the size of the drive plate. This would allow you to turn the smallest possible profile shape at the joint between top and bottom.
3. The way the central hole is bored in the body (bottom) will influence the minimum diameter for the profile on the bottom. The mechanism requires 1-1/16" for only about 1 " deep into the bottom. The rest of the central opening is a design consideration but it is typically at least 1-1/16" dia.
4. It is best to drill part way, or half way into the bottom part, from each direction, to insure the openings are centered at the ends. If the drilling wanders off center at all, it will not be visible inside the middle of the body. You are the only one who knows what's there once the mechanism is installed.