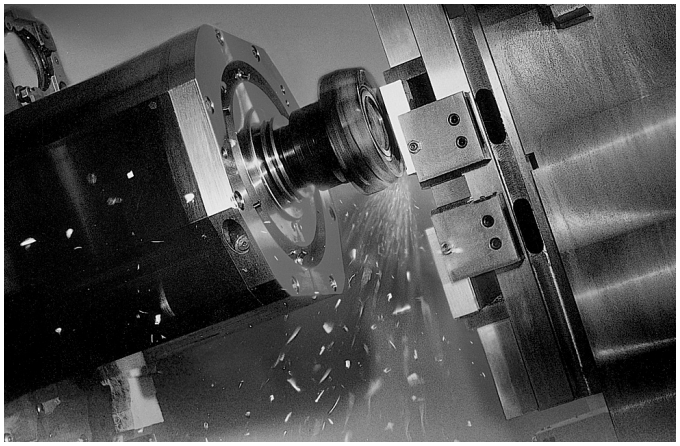


Chapter 15

Other Lathe Operations

LEARNING OBJECTIVES

After studying this chapter, students will be able to:

- Safely set up and operate a lathe using various work-holding devices.
- Properly set up steady and follower rests.
- Perform drilling, boring, knurling, grinding, and milling operations on a lathe.
- Demonstrate familiarity with industrial applications of the lathe.

INSTRUCTIONAL MATERIALS

Text: pages 261–280
Test Your Knowledge Questions, page 279
Workbook: pages 85–88
Instructor's Resource: pages 207–218
Guide for Lesson Planning
Research and Development Ideas
Reproducible Masters:
15-1 Boring Tool Clearance
15-2 Drilling on the Lathe
15-3 Using a Drill Holder
15-4 Knurling on the Lathe
15-5 Mandrels
15-6 Test Your Knowledge Questions
Color Transparency (Binder/CD only)

GUIDE FOR LESSON PLANNING

Due to the amount of material covered, this chapter should be divided into several segments. Although it has been divided into three parts here, each classroom situation will dictate what division would work best.

Part I—Drilling, Reaming, and Boring on the Lathe

Set up lathe to demonstrate the operations. Also provide an assortment of boring bars and boring bar holders for the class to examine.

Have students/trainees read and study pages 261–264. Copy and distribute Reproducible Masters 15-1, 15-2, and 15-3. Review the assignment and demonstrate the following:

- How boring techniques differ from conventional turning.
- Selecting the proper boring bar for a job.
- Positioning a boring bar for cutting.
- Preventing chatter when using long, slender boring bars.
- Precautions to be taken when drilling, reaming, and boring.

Part II—Knurling on the Lathe

Set up a lathe to demonstrate knurling. An assortment of knurling tools should be available for examination.

Have the class read and study pages 265–267. Copy and distribute Reproducible Master 15-4. Review the reading assignment and demonstrate the following:

- Reason for knurling work.
- Different types of knurls.
- Different types of knurling tools.
- How to set up the lathe for knurling.

- Knurling difficulties and how they can be corrected.
- The use of cutting fluids when knurling.
- Precautions to be taken when knurling.

Part III—The Remainder of the Chapter

Have lathes set up to demonstrate filing and polishing, the use of steady and follower rests, using mandrels, and grinding.

Have the class read and study the remainder of the chapter. Discuss and demonstrate the following:

- Reasons filing and polishing on the lathe should be kept to a minimum.
- Safe way to file.
- When and how steady and follower rests are used.
- The use of mandrels. Use Reproducible Master 15-5.
- Grinding on the lathe.
- Precautions that must be taken when grinding on the lathe.
- Milling on the lathe.
- Special lathe attachments.
- Industrial applications of the lathe.

Briefly review the demonstrations. Provide students/trainees with the opportunity to ask questions.

Technical Terms

Review the terms introduced in the chapter. New terms can be assigned as a quiz, homework, or extra credit. The following list is also given at the beginning of the chapter.

automatic screw machine
boring
boring mills
follower rest
knurling
mandrel
reaming
steady rest
turret
turret lathe

Review Questions

Assign *Test Your Knowledge* questions. Copy and distribute Reproducible Master 15-6 or have students use the questions on page 279 in the text and write their answers on a separate sheet of paper.

Workbook Assignment

Assign Chapter 15 of the ***Machining Fundamentals Workbook.***

Research and Development

Discuss the following topics in class or have students complete projects on their own.

1. Visit a local industry that uses automatic screw machines, turret lathes, and/or CNC lathes and turning centers in manufacturing their products. Prepare a short paper describing your impressions of these machines in action.
2. Borrow samples of products made on automatic screw machines and turret lathes. What characteristics, if any, do they have in common?
3. Prepare a lesson on milling on the lathe.
4. Prepare a display case or display of the various products made in your machine shop. Show several of them in various stages of construction.

TEST YOUR KNOWLEDGE ANSWERS, Page 279

1. straight, taper
2. b. An internal machining operation in which a single-point cutting tool is employed to enlarge a hole.
3. When accuracy in diameter and finish is specified.
4. knurling, gripping surface
5. It is done to remove burrs, round off sharp edges, and to blend in form cut outlines.
6. fine finish
7. When additional support is needed to prevent long and/or slender work from springing away from the cutting tool during machining. It also reduces "chattering."
8. The steady rest is bolted directly to the ways. The follower rest provides support directly in back of the cutting tool, bolts to the carriage, and follows along during the cut.
9. cat head
10. A shaft inserted through a hole in a component to support the work during machining. Used when it is necessary to machine the outside of work concentric with a hole that has been previously bored or reamed. A *solid mandrel* is made from a section of hardened steel that has been machined with a slight taper. An

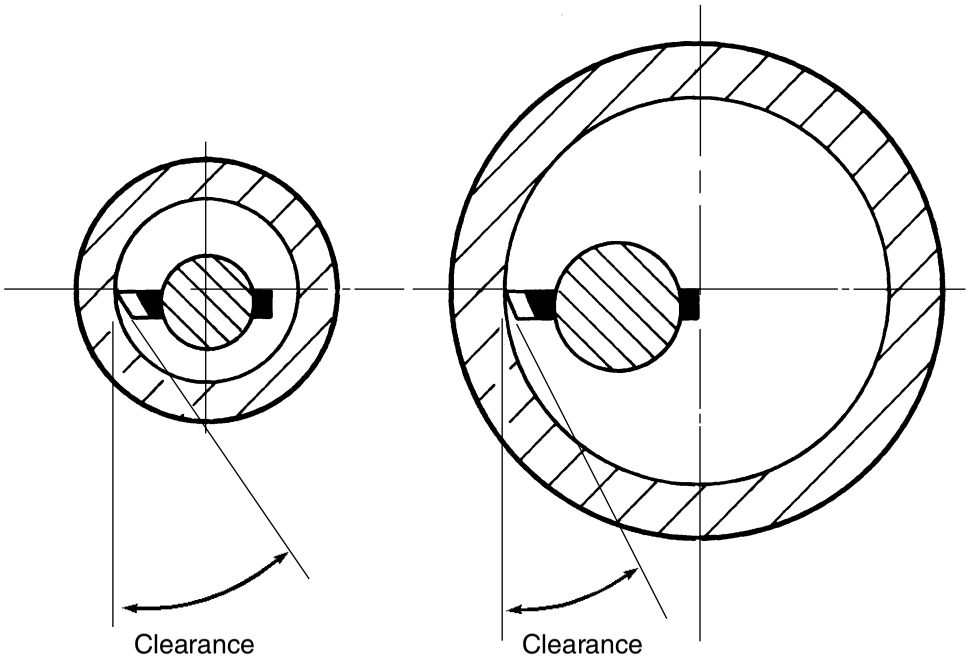
expansion mandrel is machined from hardened steel and permits work with ope nings that vary from standard sizes to be turned. A *gang mandrel* is used when many pieces of the same configuration must be turned.

11. arbor press
12. tool post grinder
13. b. Cover the bed and moving parts with a heavy cloth.

WORKBOOK ANSWERS, Pages 85–88

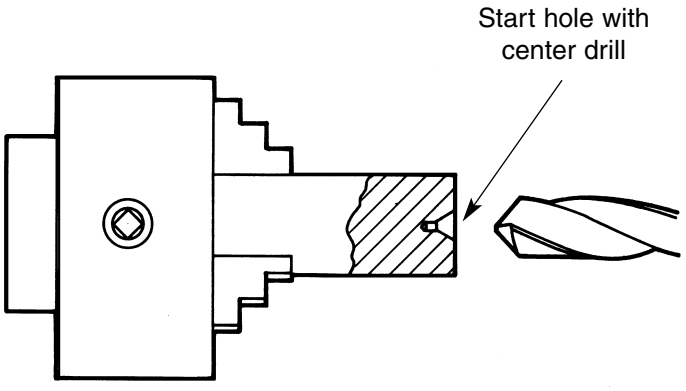
1. Boring is employed to enlarge a hole to a specified size where a drill or reamer will not do the job.
2. reversed
3. To prevent the bottom of the tool from rubbing on the bored surface.
4. b. on center
5. tool holder
6. Any order: using a slower spindle speed; reducing tool overhang; grinding a smaller radius on the nose of the cutting tool; placing a weight on the back overhang of the boring bar; placing the tool slightly below center.
7. combination, countersink (center drill)
8. taper
9. pilot, dead center
10. Check for adequate clearance between the back of the work and the chuck face.
11. a. 0.030″ (0.8 mm)
    b. 0.010″ (0.25 mm)
    c. 0.025″ (0.6 mm)
    d. 0.015″ (0.4 mm)
    e. 0.020″ (0.5 mm)
12. One wheel is dull.
13. Move the carriage out of the way, use the left hand technique of filing, and keep the file moving.
14. centers
15. Any order: grind shafts, true lathe centers, and sharpen reamers and milling cutters.
16. Evaluate individually. Refer to Section 15.7.1.
17. The point at which the grinding wheel no longer cuts.
18. a. in opposite directions
19. vertical boring
20. turret

Boring Tool Clearance

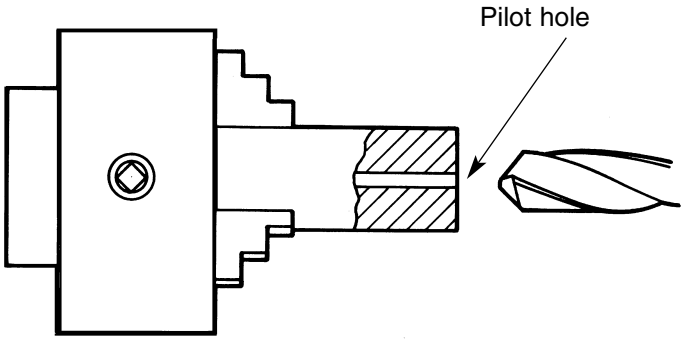


Tool used to bore small diameter holes requires greater front clearance to prevent rubbing.

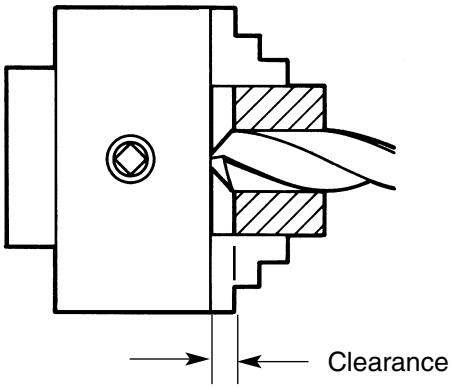
Drilling on the Lathe



The drill will cut exactly on the center if the hole is started with a center drill.

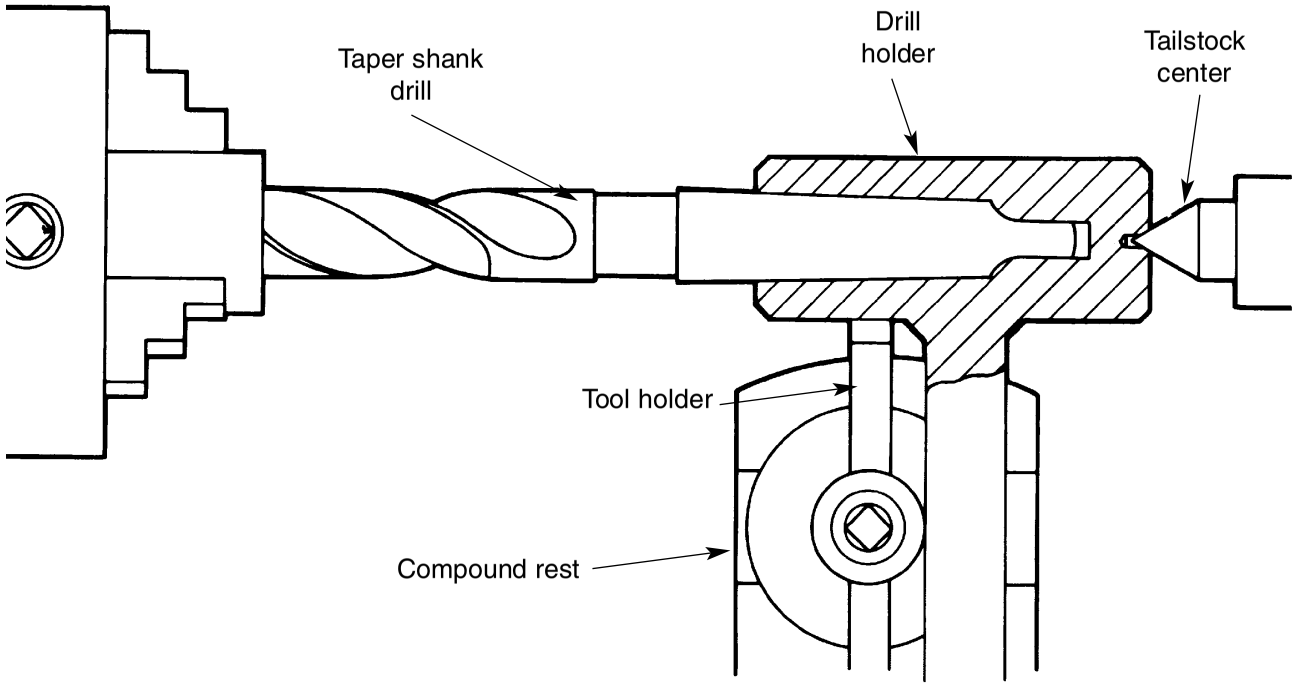


Holes larger than1/2″ (12.5 mm) in diameter require drilling of a pilot hole.



There must be enough clearance between the back of the work and the chuck face to permit the drill to break through the work without damaging the chuck.

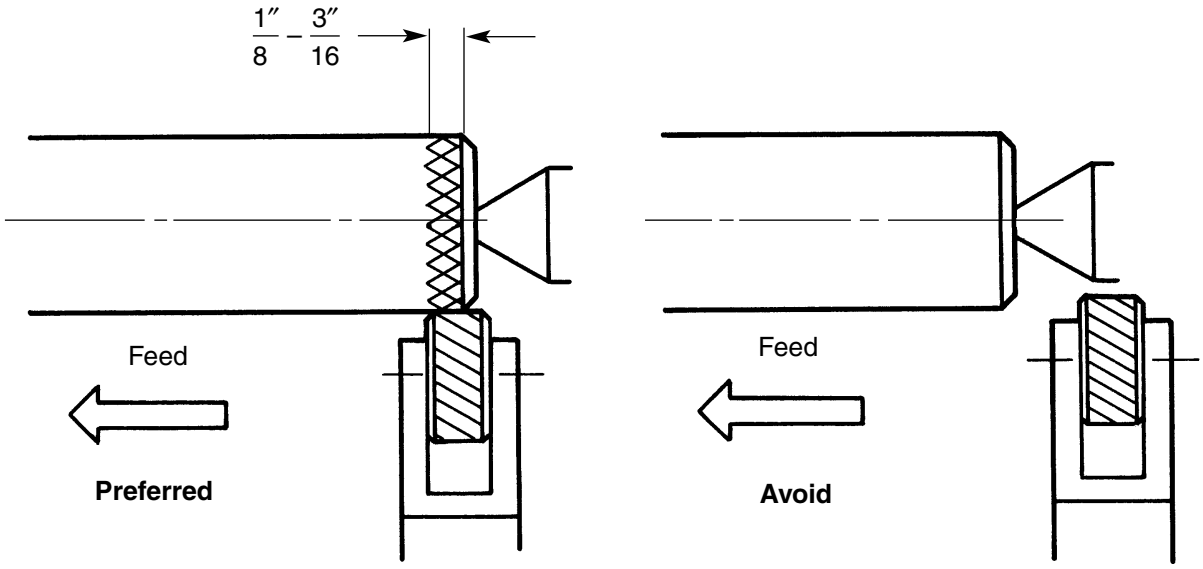
Using a Drill Holder



Knurling on the Lathe

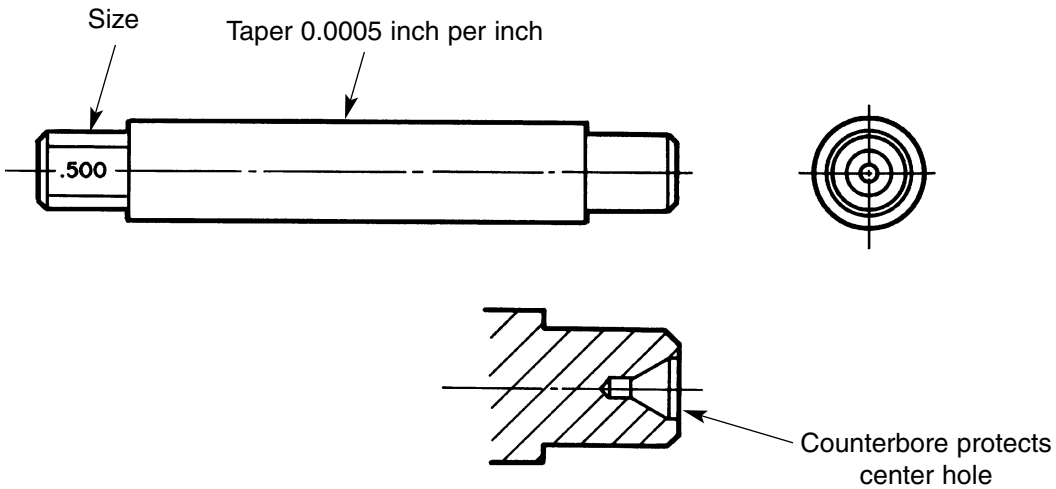
Procedure

1. Mark of section to be knurled.
2. Adjust the lathe to a slow back-geared speed and fairly rapid feed.
3. Place the knurling tool in the post. Bring it up to work. Both wheels must bear evenly on the work with their faces parallel with the centerline of the piece. See figure below.

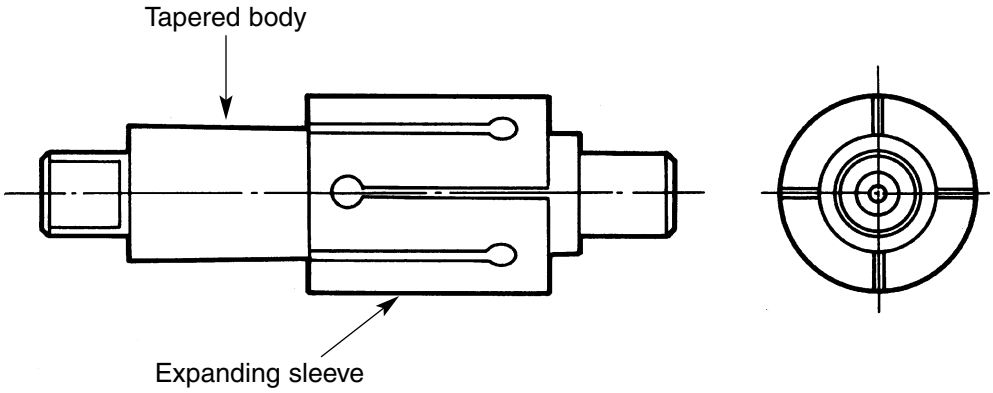


4. Start the lathe and slowly force the knurls into the work surface until a pattern begins to form. Tool travel should be *toward* the headstock whenever possible. Engage the automatic feed and let the tool travel across the work. Flood the work with cutting fluid.
5. When the knurling tool reaches the proper position, reverse spindle rotation and allow the tool to move back across the work to the starting point. Apply additional pressure to force the knurls deeper into the work.

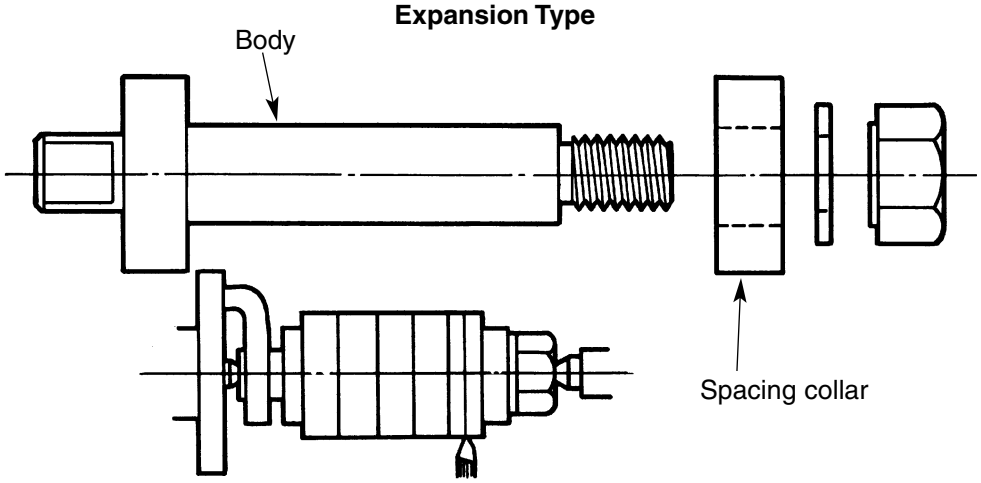
Mandrels



Solid Type



Expansion Type



Gang Mandrel

Other Lathe Operations

Name: _____ Date: _____ Score: _____

1. Drills that are used on the lathe are fitted with _____ shanks or _____ shanks. 1. _____

2. Boring is: 2. _____
   a. A drilling operation.
   b. An internal machining operation in which a single-point cutting tool is employed to enlarge a hole.
   c. An external machining operation in which a single-point cutting tool is employed to reduce the diameter of a hole.
   d. All of the above.
   e. None of the above.

3. When is reaming done? _____

4. The process of forming horizontal or diamond-shaped serrations on the circumference of the work is called _____. It is commonly done to provide a _____. 4. _____

5. When is filing on the lathe usually done? _____

6. Polishing is an operation used to produce a _____ on the work. 6. _____

7. When is a steady rest used? _____

8. What is the difference between a steady rest and a follower rest? _____

9. There are times when a shaft is unsuitable as a bearing surface and cannot be used with a steady rest. When this occurs, a _____ can be employed so the shaft can be supported with the steady rest. 9. _____

Name: _____

10. What is a mandrel? _____

_____

_____

_____

When is it used? _____

_____

_____

_____

11. A mandrel is usually pressed into the work with an _____. 11. _____

12. Internal and external grinding can be done on a lathe with a _____. 12. _____

13. What should be done to protect the lathe from the abrasive particles that wear away from the grinding wheel? 13. _____

a. Use a nonabrasive grinding wheel.
b. Cover the bed and moving parts with a heavy cloth.
c. Use a soft abrasive grinding wheel.
d. All of the above.
e. None of the above.