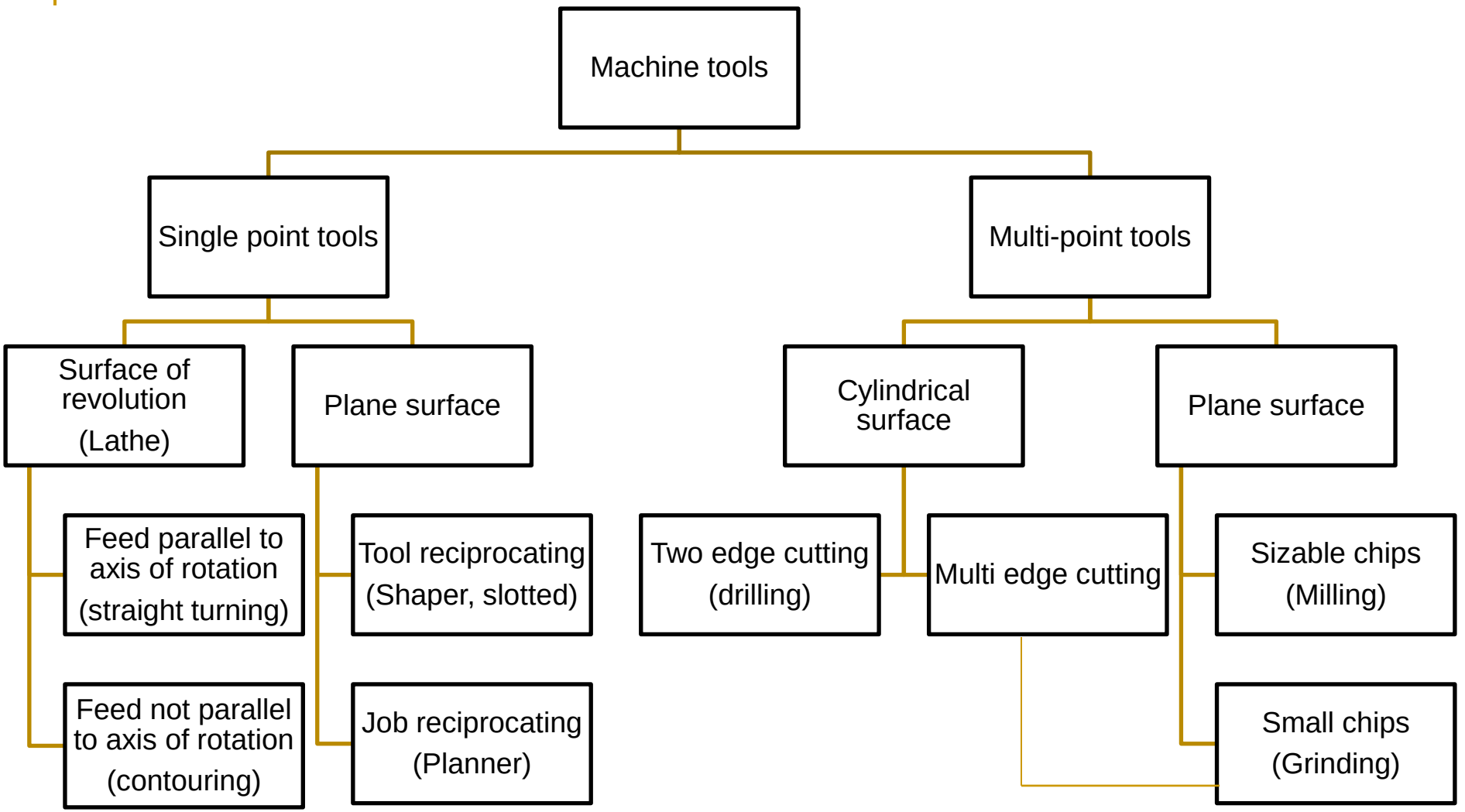
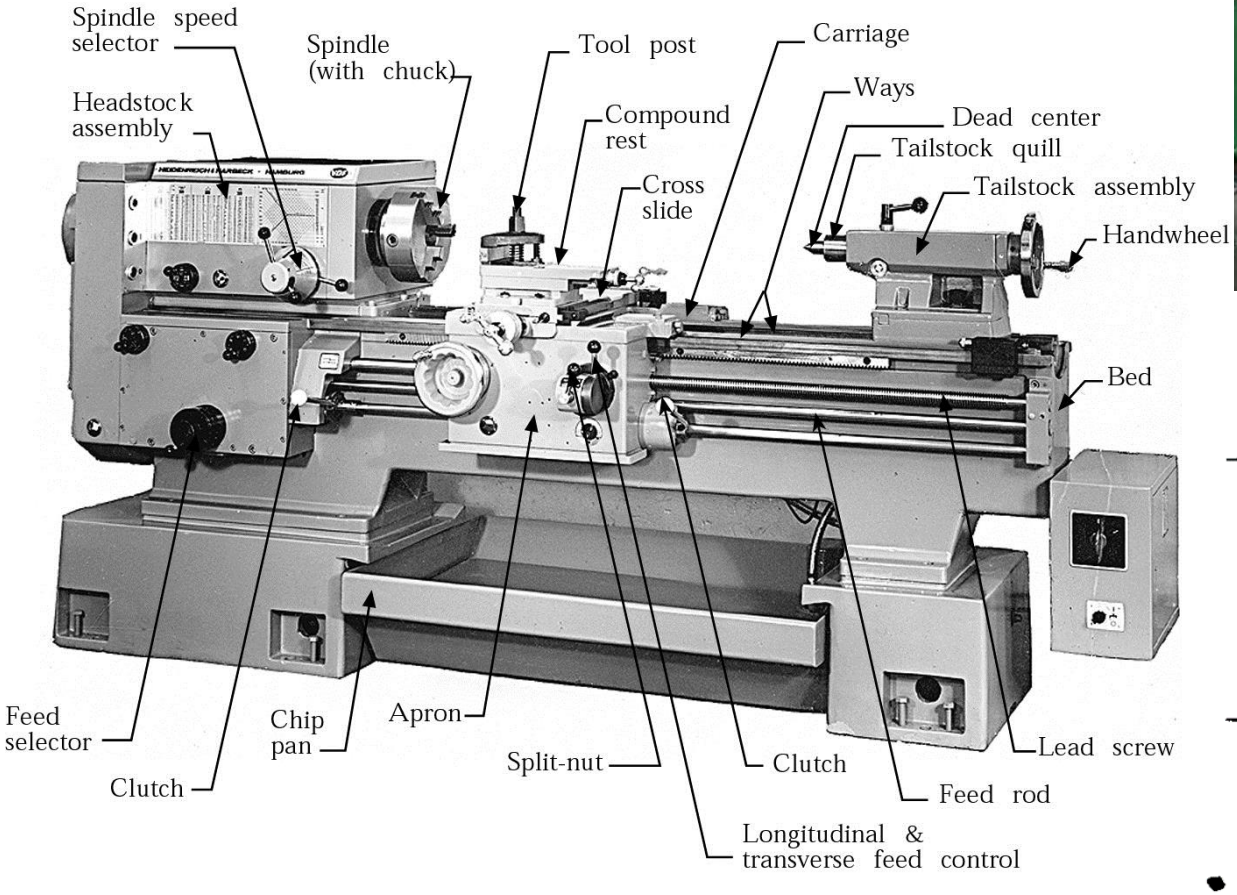
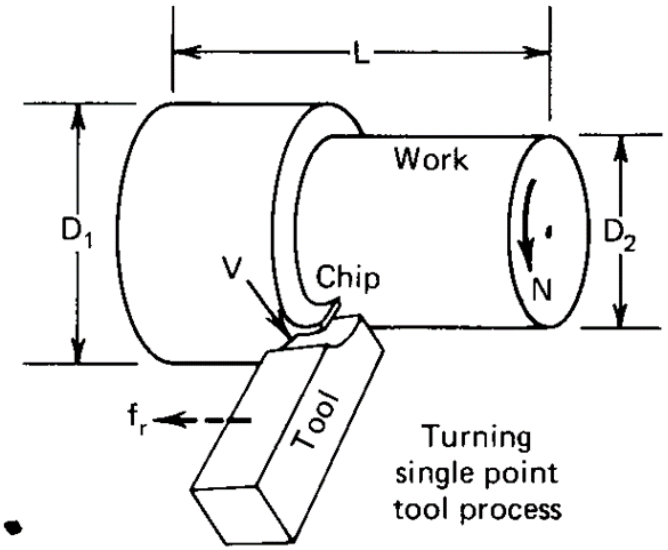
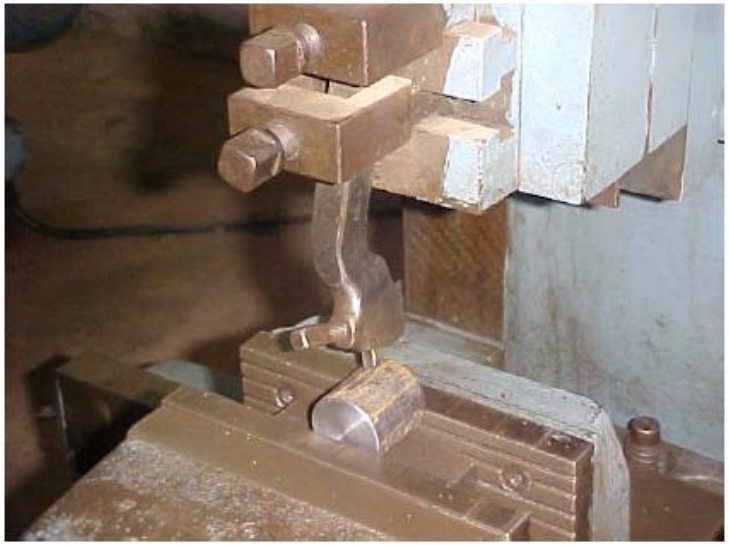
Machine Tools


Machine tools
Single point tools
Multi-point tools
Surface of revolution (Lathe)
Plane surface
Cylindrical surface
Plane surface
Feed parallel to axis of rotation (straight turning)
Feed not parallel to axis of rotation (contouring)
Tool reciprocating (Shaper, slotted)
Job reciprocating (Planner)
Two edge cutting (drilling)
Multi edge cutting
Sizable chips (Milling)
Small chips (Grinding)


Spindle speed selector
Spindle (with chuck)
Tool post
Carriage
Headstock assembly
Ways
Compound rest
Dead center
Tailstock quill
Cross slide
Tailstock assembly
Handwheel
Bed
Feed selector
Chip pan
Apron
Split-nut
Clutch
Lead screw
Clutch
Feed rod
Longitudinal & transverse feed control


L
Work
D1
D2
V
Chip
N
fr
Tool
Turning single point tool process



Cutting tool in action

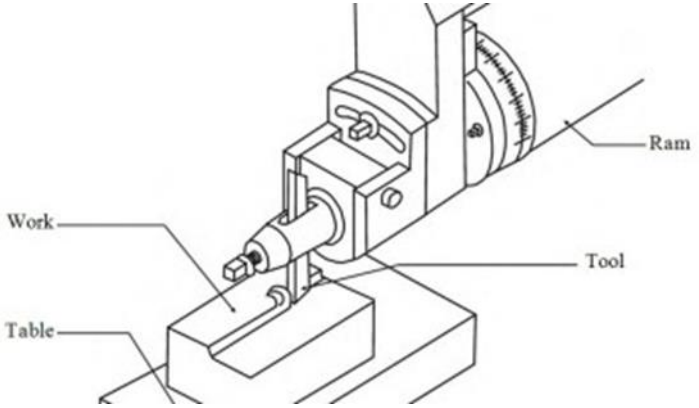


Fig. 4.4.1 *Photographic view of a shaping machine*

Cutting tool in action

Fig. 4.4.3 *Photographic view of a planing machine*

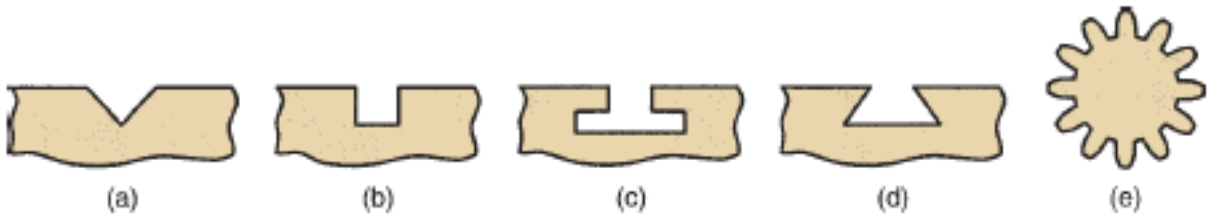
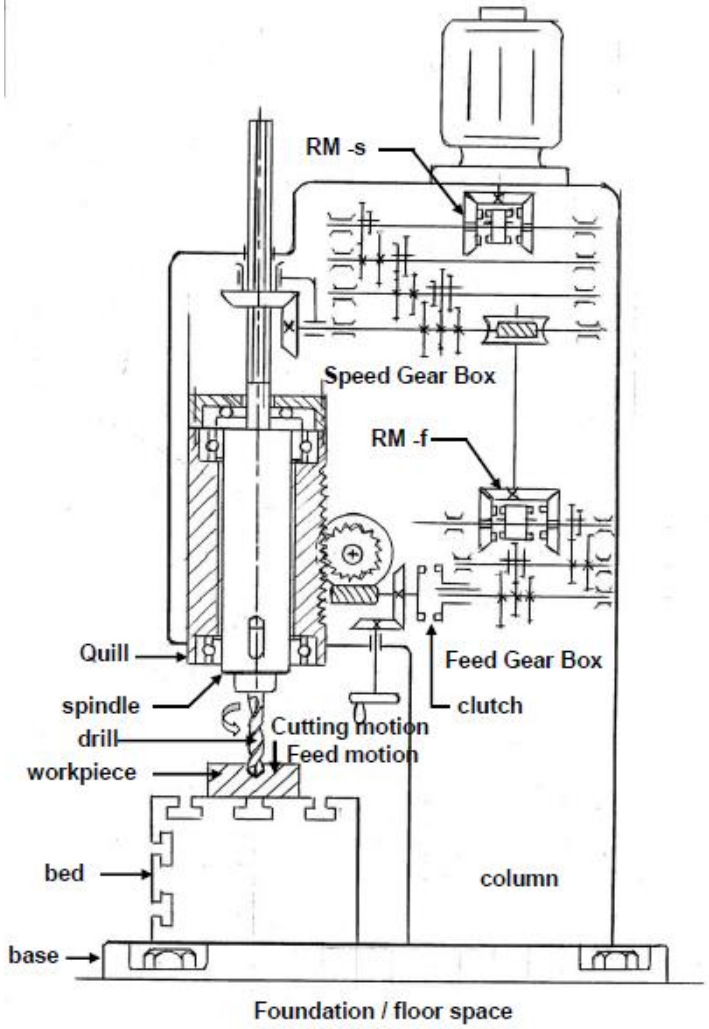
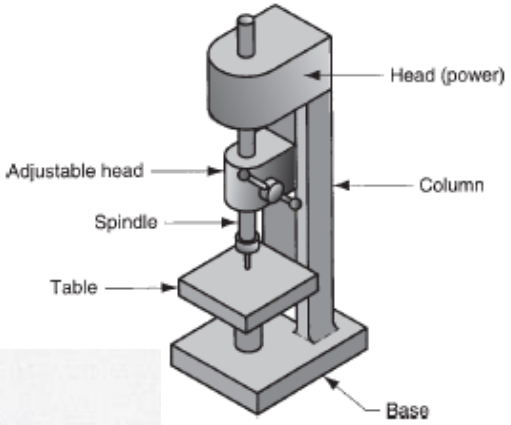
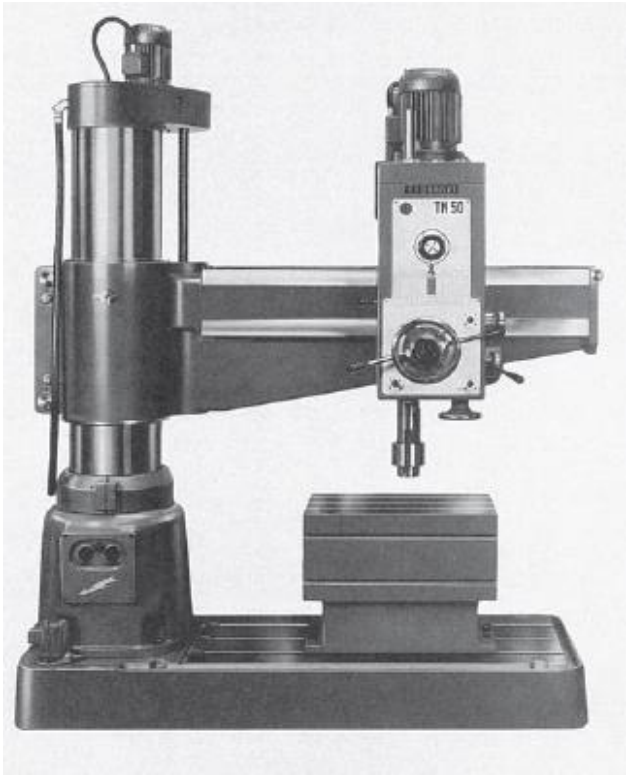


FIGURE 21.32 Types of shapes that can cut by shaping and planing: (a) V-groove, (b) square groove, (c) T-slot, (d) dovetail slot, and (e) gear teeth.





Upright drill press



Radial drill press

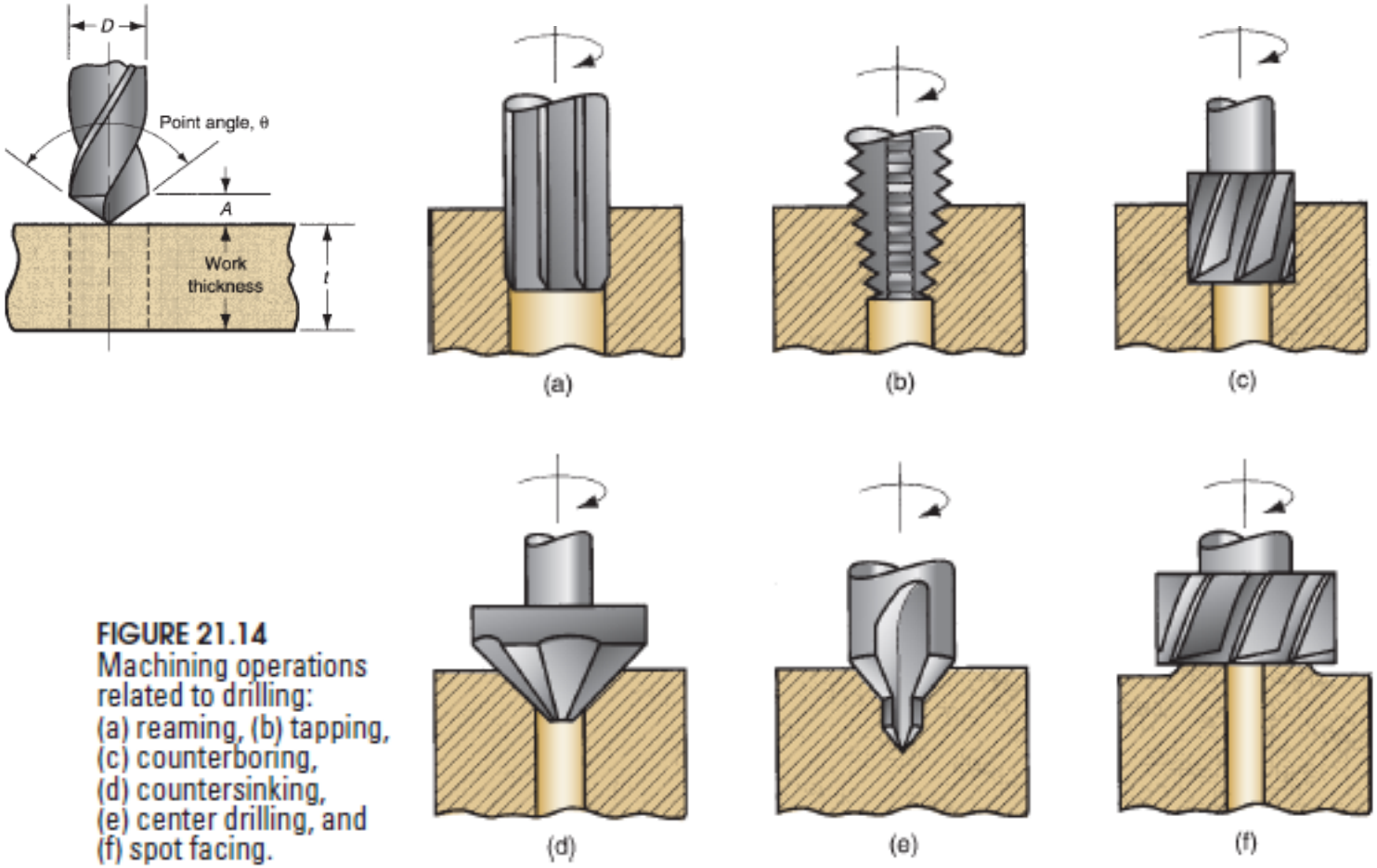
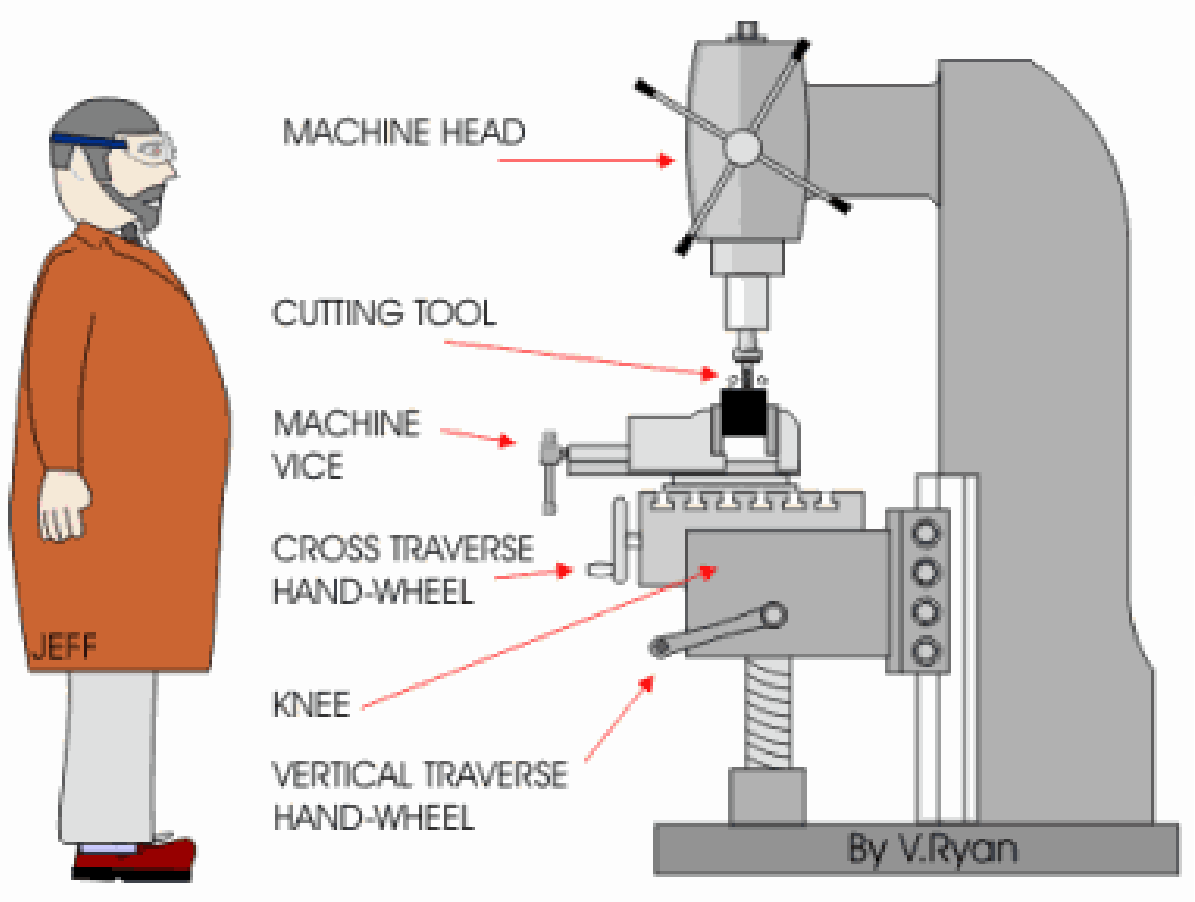
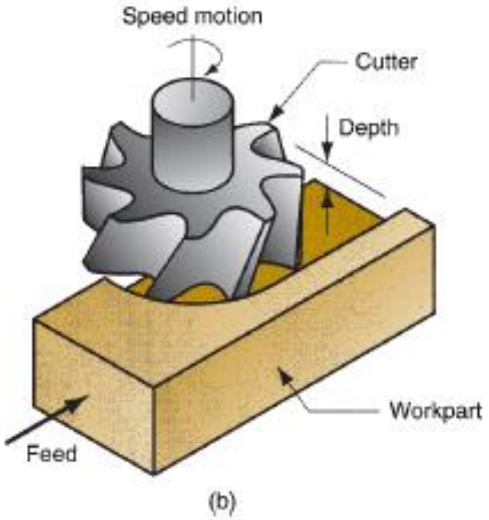
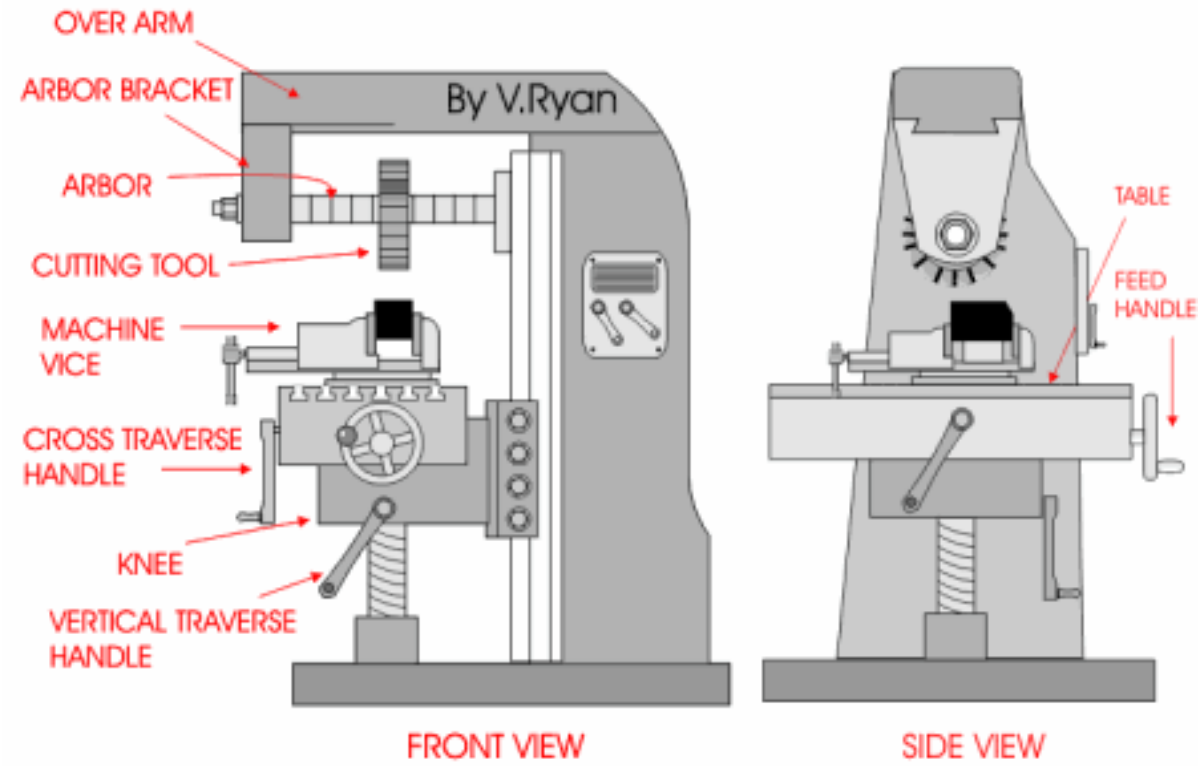


FIGURE 21.14
Machining operations related to drilling: (a) reaming, (b) tapping, (c) counterboring, (d) countersinking, (e) center drilling, and (f) spot facing.

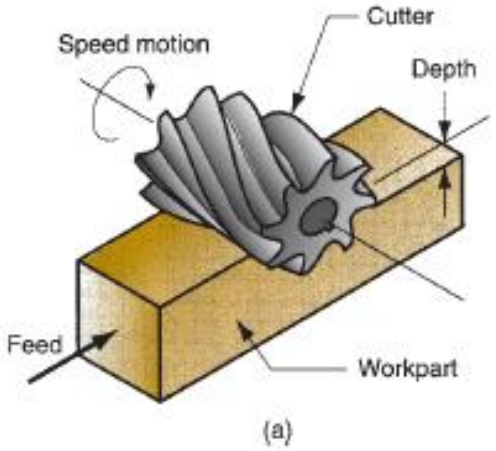




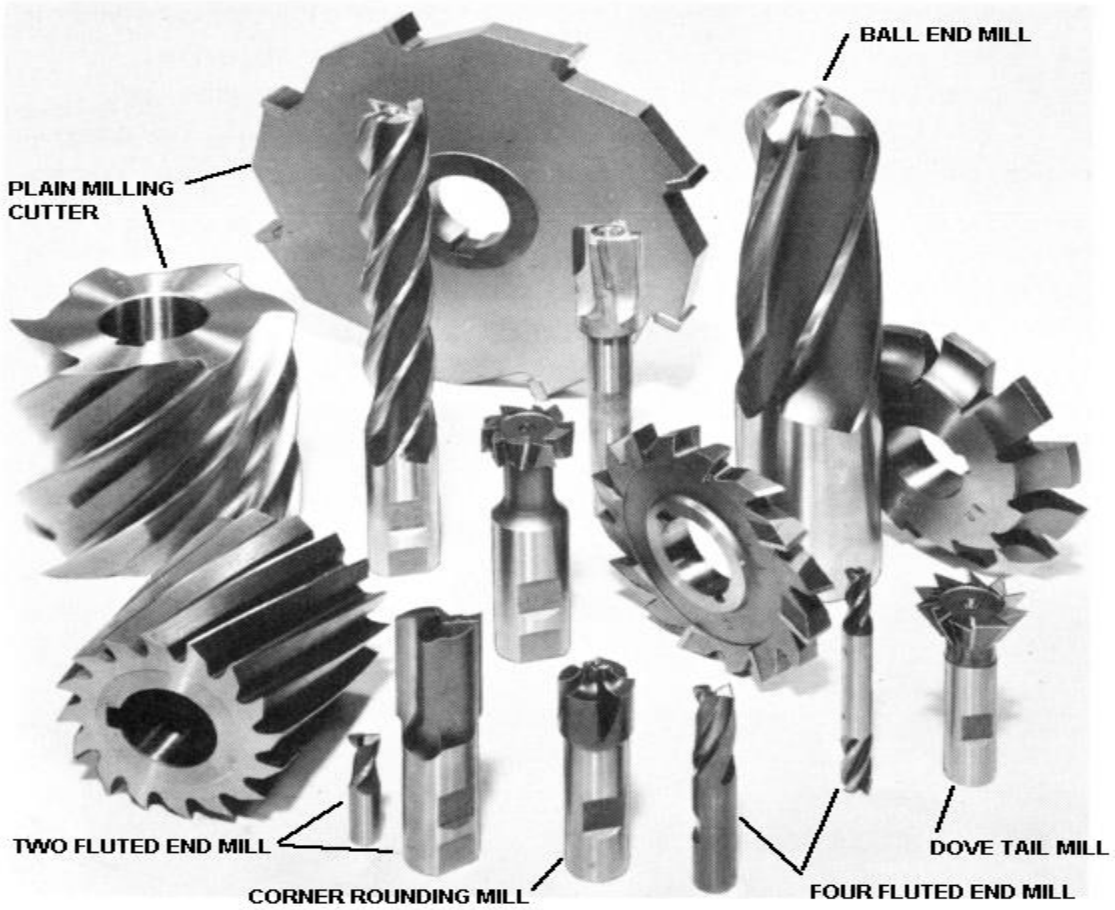
Vertical milling machine

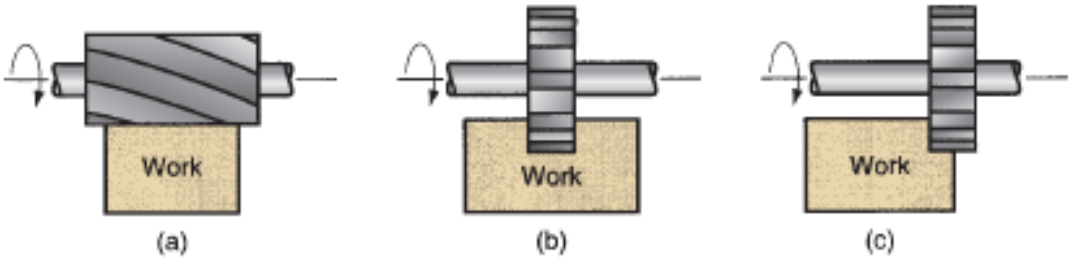


Horizontal milling machine



Milling cutters





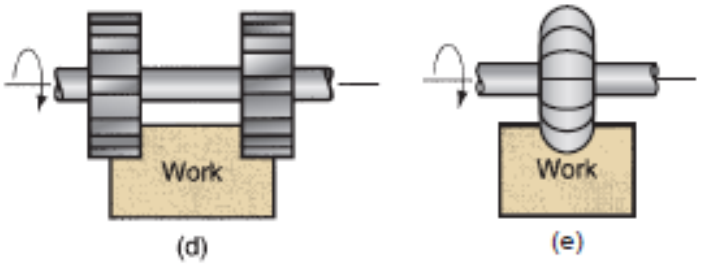
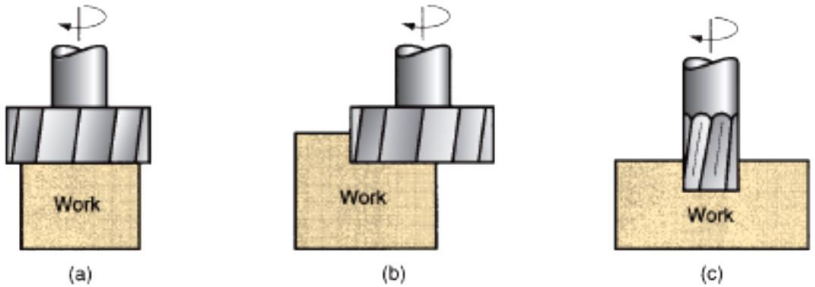


FIGURE 21.18
Peripheral milling:
(a) slab milling,
(b) slotting,
(c) side milling,
(d) straddle milling, and
(e) form milling.



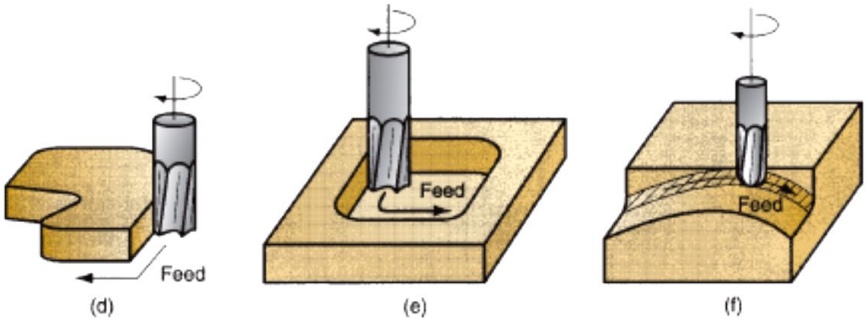


FIGURE 21.20 Face milling: (a) conventional face milling, (b) partial face milling, (c) end milling, (d) profile milling, (e) pocket milling, and (f) surface contouring.

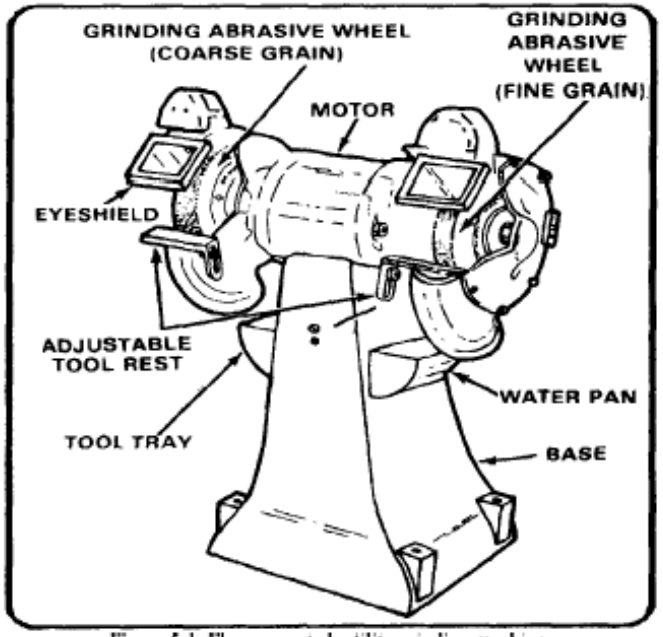


Figure 5-1. Floor-mounted utility grinding machine.

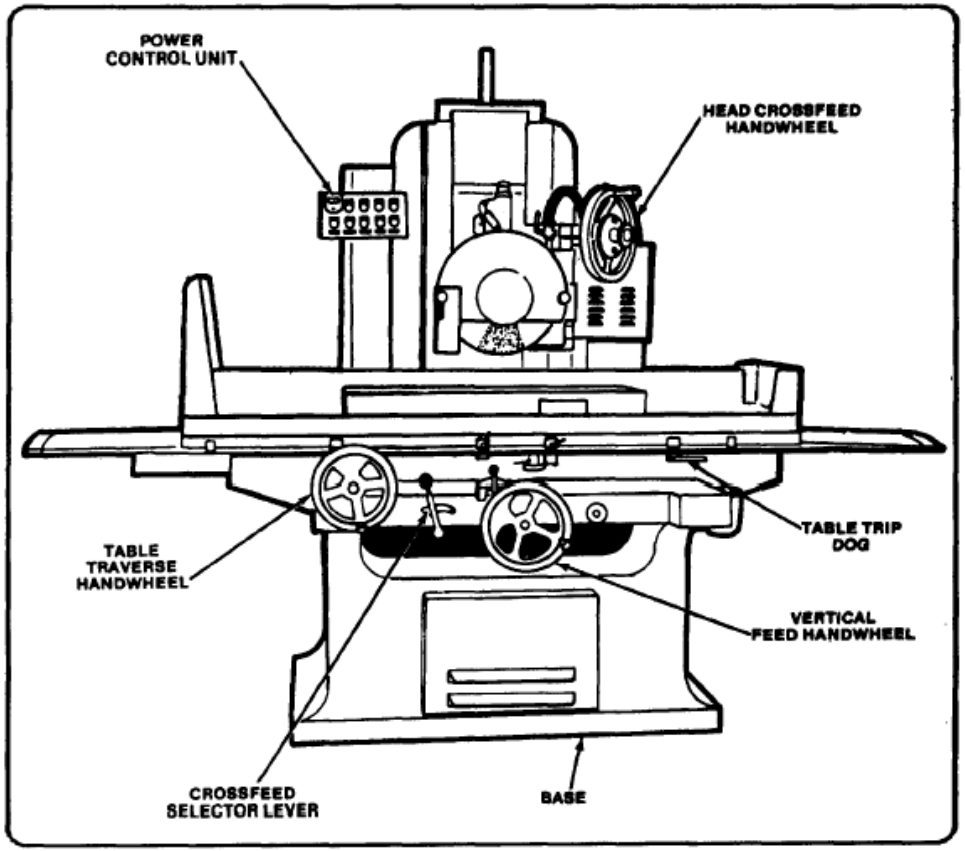


Figure 5-6. Reciprocating surface grinding machine.

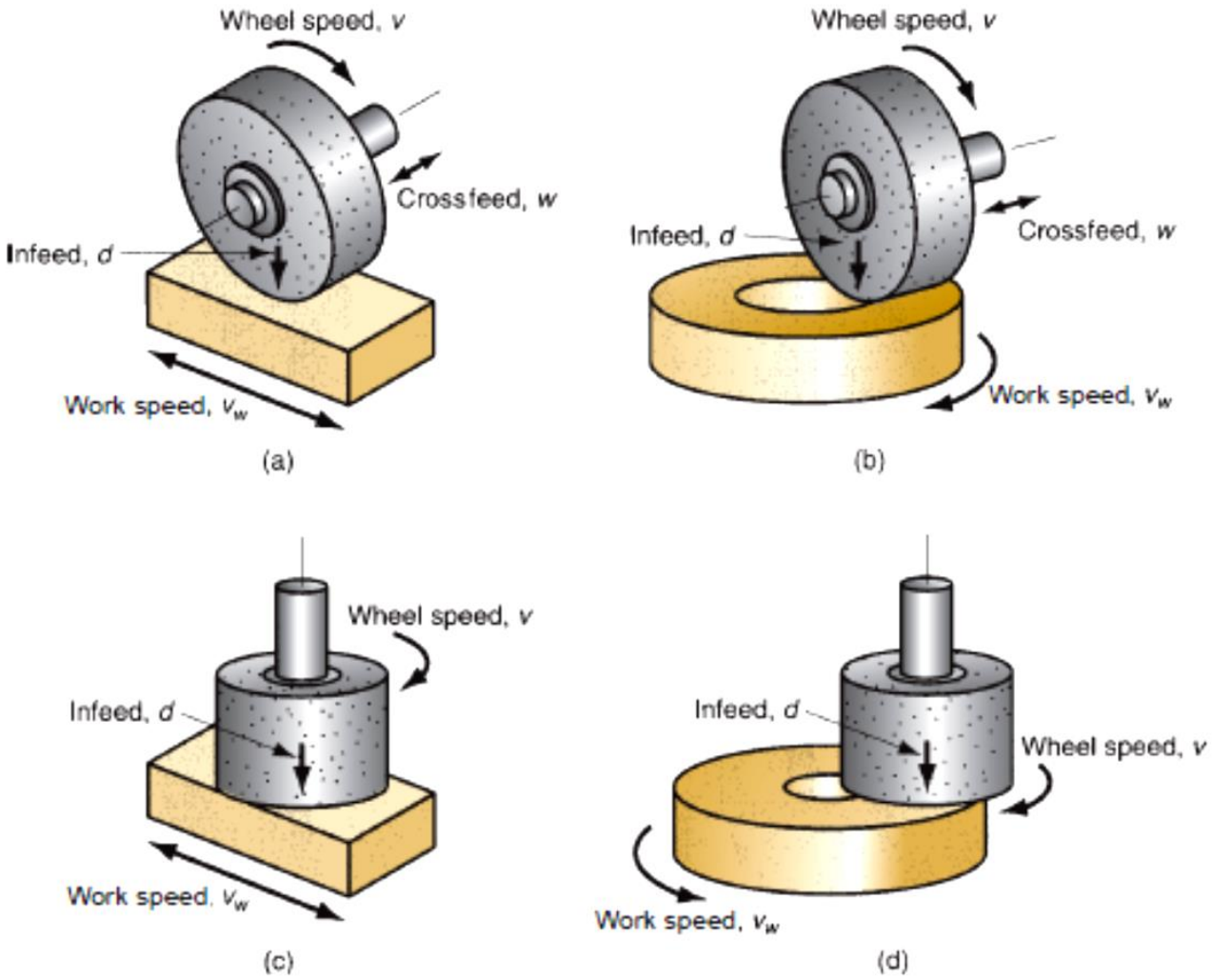
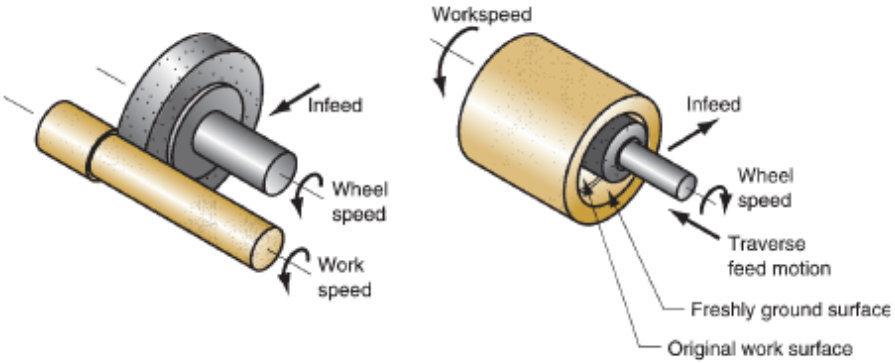


FIGURE 24.7 Four types of surface grinding: (a) horizontal spindle with reciprocating worktable, (b) horizontal spindle with rotating worktable, (c) vertical spindle with reciprocating worktable, and (d) vertical spindle with rotating worktable.

Center-type cylindrical grinding is commonly used for producing external cylindrical surfaces.



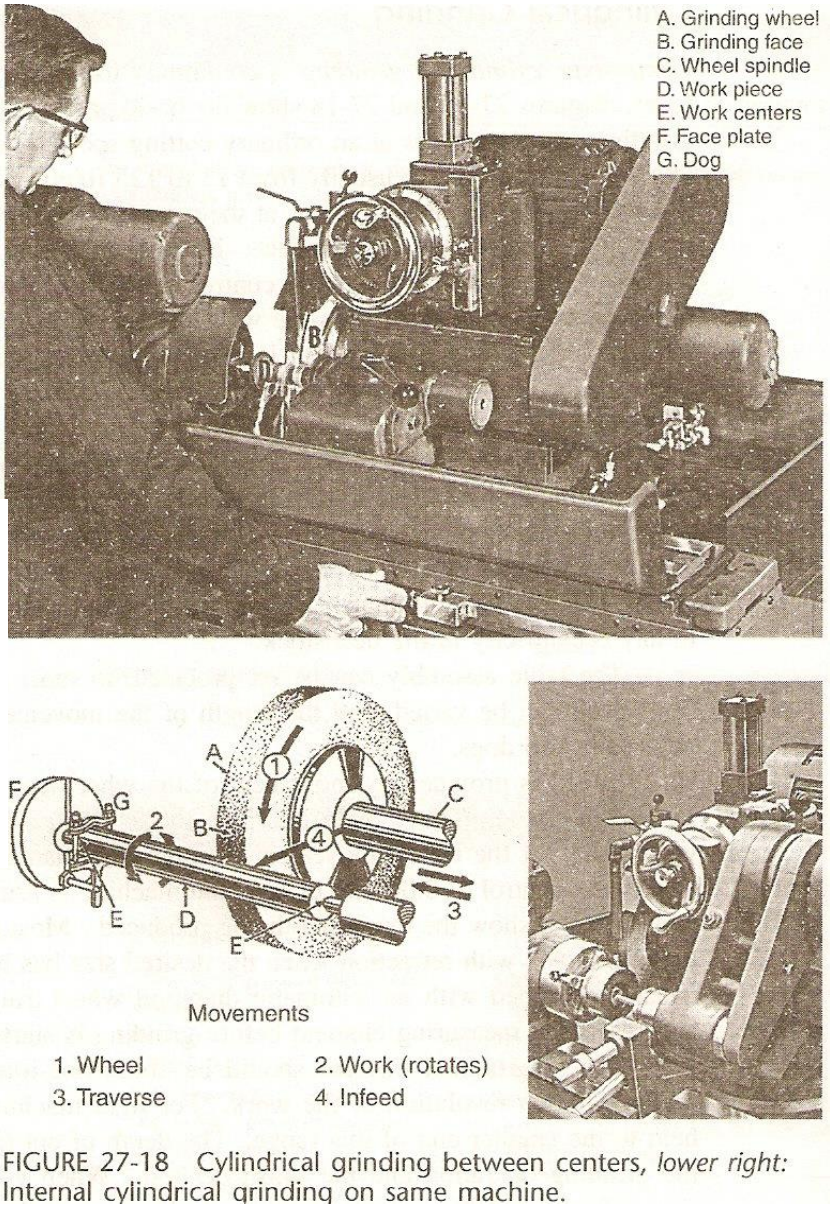
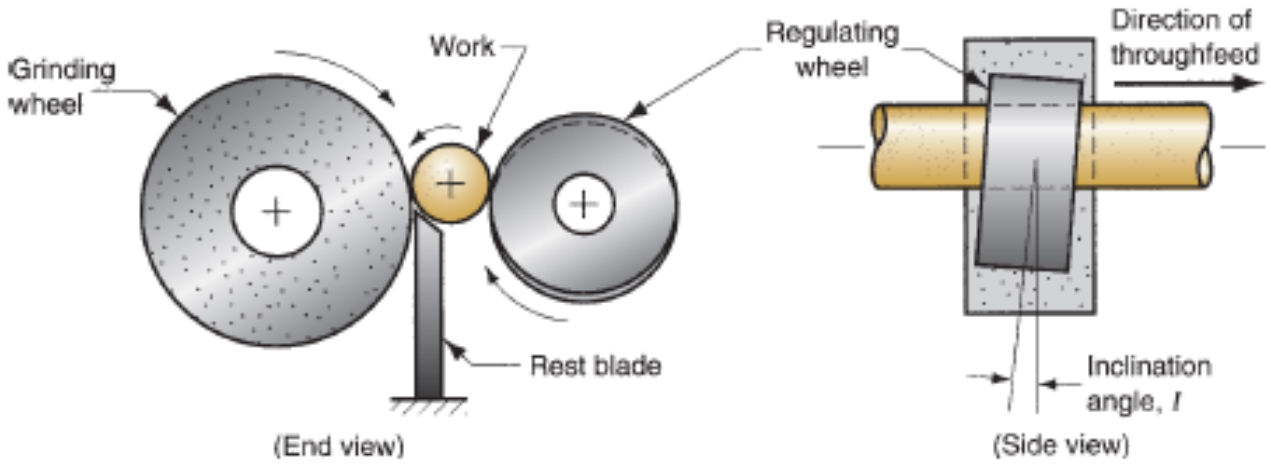


FIGURE 27-18 Cylindrical grinding between centers, *lower right:* Internal cylindrical grinding on same machine.



Centerless Grinding