Lapping. This is an operation for finishing flat, cylindrical, or curved surfaces. Generally, the *lap* (Fig. 26.31a) is relatively soft and porous, made of such materials as cast iron, copper, leather, or cloth. The abrasive particles either are embedded in the lap or may be carried in a slurry. Lapping of spherical objects and glass lenses is done with specially shaped laps. *Running-in* of mating gears can be done by lapping, as on hypoid gears for rear axles. Depending on the type and hardness of the workpiece material, lapping pressures range from 7 to 140 kPa.

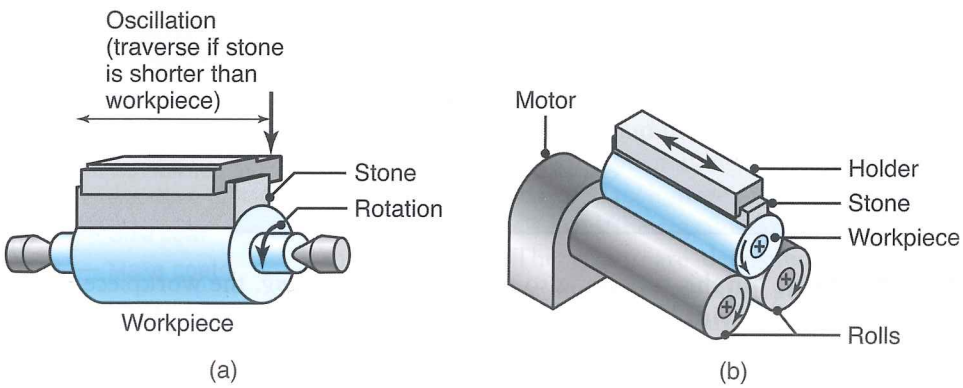

FIGURE 26.30 Schematic illustrations of the superfinishing process for a cylindrical part. (a) Cylindrical microhoning. (b) Centerless microhoning.

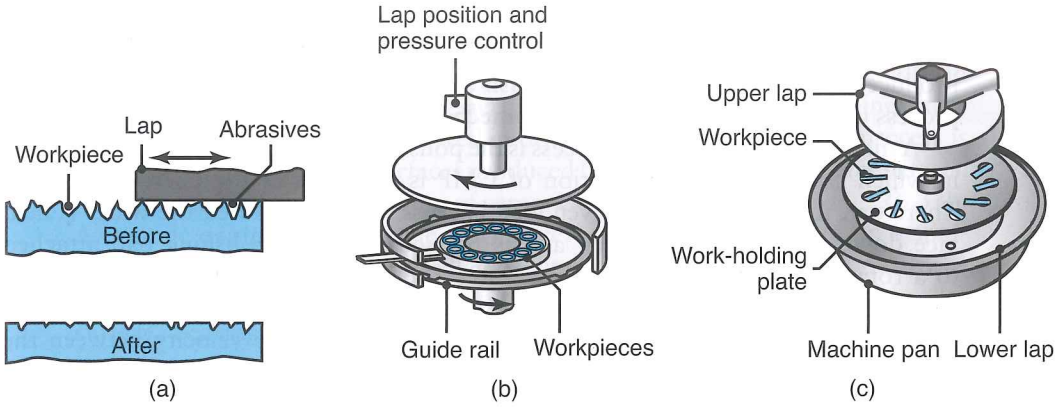

FIGURE 26.31 (a) Schematic illustration of the lapping process. (b) Production lapping on flat surfaces. (c) Production lapping on cylindrical surfaces.

Dimensional tolerances on the order of ±0.0004 mm can be obtained in lapping by using fine abrasives (up to grit size 900), and the surface finish can be as smooth as 0.025–0.1 μm. Production lapping on flat or cylindrical pieces is done on machines similar to those shown in Figs. 26.31b and c.

Polishing. *Polishing* is a process that produces a smooth, lustrous surface finish. The basic mechanism involved in the polishing process is the softening and smearing of surface layers, by frictional heating developed during polishing, as well as by some very fine-scale abrasive removal from the workpiece surface. The shiny appearance commonly observed on polished surfaces results from a smearing action.

Polishing is done with disks or belts, made of fabric, leather, or felt, which typically are coated with fine powders of aluminum oxide or diamond. In *double-sided polishing*, pairs of pads are attached to the faces of platens that rotate horizontally and in opposite directions. Parts with irregular shapes, sharp corners, deep recesses, and sharp projections can be difficult to polish.