



FIGURE 8.24 Punch and die set. A: Upper punch. B: Die cavity. C: Die. D: Lower punch. (Courtesy of Cherry-Burrell Corporation.)

punches, a lower punch and an upper punch (Fig. 8.24).

The operation of a single-punch tablet press describes the basic mechanical process. As the lower punch drops, the feed shoe filled with granulation from the hopper is positioned over and fills the die cavity. The feed shoe retracts, scrapes away the excessive granulation, and levels the fill in the die cavity. The upper punch lowers and compresses the fill, forming the tablet. The upper punch retracts as the lower punch rises with the formed tablet to the precise level of the stage. The feed shoe moves over the die cavity, shoves the tablet aside, and once again fills the cavity with granulation to repeat the process. The tablets fall into a collection container. Samples of tablets are assayed and tested for the various quality standards described earlier.

Rotary tablet machines equipped with multiple punches and dies operate via continuous rotating movement of the punches. A single rotary press with 16 stations (16 sets of punches and dies) may produce up to 1,150 tablets per minute. Double rotary tablet presses with 27, 33, 37, 41, or 49 sets of punches and dies are capable of producing two tablets for each die. Some of these machines can produce 10,000 or more tablets per minute of operation (Fig. 8.25). For such high-speed production, induced die feeders are required to force the fill material into the dies to keep up with the rapidly moving punches (Fig. 8.26).



FIGURE 8.25 Manesty Rotapress rotary compression machine. Tablets leaving the machine run over a tablet duster to screen, where they are inspected. Material to be compressed is fed from the overhead hopper through yoke to the two compressing machine hoppers. Hardness of tablet is monitored electronically by oscilloscope at right. (Courtesy of Upjohn Company.)

A consequence of high-speed production is the increased occurrence of *lamination* (horizontal striations) and tablet *capping*, in which the top of the tablet separates from the whole because the fill material does not have enough time to bond after compression. Reduced speed remedies the problem (17).

Multiple-layer tablets are produced by multiple feed and multiple compression of fill material within a single die. Tablets with an inner core are prepared by machines with a special feed apparatus that places the core tablet precisely within the die for compression with surrounding fill.

Direct Compression Tableting

Some granular chemicals, like potassium chloride, possess free-flowing and cohesive properties that enable them to be compressed directly in a tablet machine without any need of granulation. For chemicals lacking this quality, special pharmaceutical