FIG 21-11 *Top,* Flutter device components showing the pipe stem, cone with steel ball, and perforated top. *Bottom,* The Acapella device. (From Marks JH: Airway clearance devices in cystic fibrosis, *Paediatr Respir Rev* 8(1):17-23, 2007.)

The active cycle of breathing technique is a series of breathing techniques to help clear secretions. Forced expiration, or "huffing," with the glottis partially closed helps move secretions from the small airways so that subsequent coughing can move secretions forcefully from the large airways. This maneuver enhances the pulmonary function of patients with CF. Autogenic drainage involves a variety of breathing techniques, which older children can use to force mucus in lower lobes up into the airways so that it can be successfully expelled. Another mucus-clearing technique involves use of a PEP mask; this technique involves breathing into a mask attached to a one-way valve, which creates resistance—as the patient exhales, the airway is kept open by the pressure, and mucus is forced into the upper airway for expulsion.

Bronchodilator medication delivered in an aerosol opens bronchi for easier expectoration and is administered before percussion and postural drainage when the patient exhibits evidence of reactive airway disease or wheezing. Another aerosolized medication is recombinant human deoxyribonuclease (DNase, known generically as dornase alfa [Pulmozyme]), which decreases the viscosity of mucus. It is well tolerated and has no major adverse effects; minor reactions are voice alterations and laryngitis. This medication, given daily via nebulization generally before or with percussion and postural drainage, has resulted in improvements in spirometry,