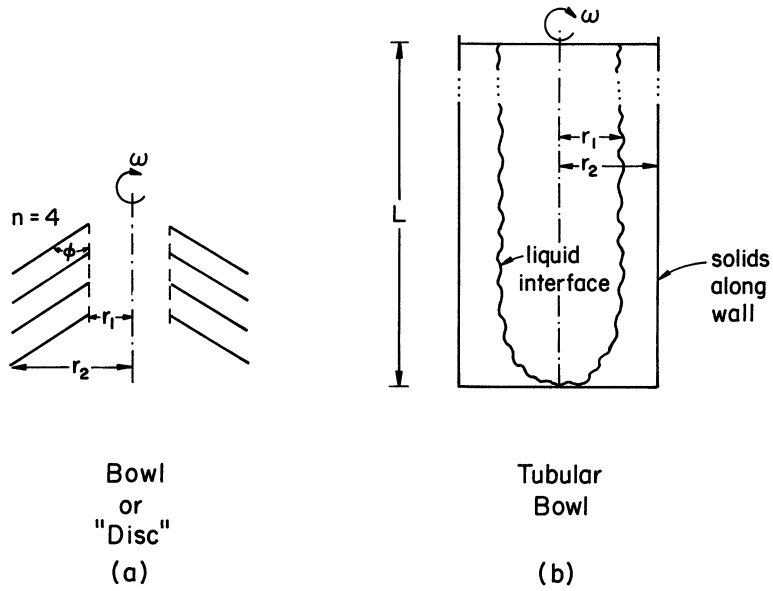

Figure 11.7. Two types of common centrifuges are depicted. (a) A disc or bowl centrifuge with multiple separator bowls or discs. The scale-up factor depends on the two radial distances, r_1 and r_2, the angle ϕ, the rotational speed, ω, and n, the number of discs or effective separator bowls. (b) A tubular bowl centrifuge can operate with continuous liquid feed with the span of continuous operation determined by the capacity of the bowl to collect solids. Key scale-up parameters are the distances r_1 and r_2, the height of the unit, L, and the rotational speed, ω.

$$y = \frac{r\omega^2 D_p^2(\rho_p - \rho_f)}{18\mu} \cdot \frac{V_c}{F_c} \tag{11.21}$$

where V_c is liquid volume in the centrifuge and F_c is liquid flow rate through the centrifuge.

By substituting $y = L_e/2$ and $r = r_e$ into eq. 11.21, we obtain

$$F_c = 2\left[\frac{gD_p^2(\rho_p - \rho_f)}{18\mu}\right]\frac{r_e\omega^2 V_c}{gL_e} \tag{11.22}$$

or

$$F_c = 2U_0\Sigma \tag{11.23}$$

where $\Sigma = r_e\omega^2 V_c/gL_e$, which is known as the *centrifugation coefficient,* U_0 is the free settling velocity of the particles under gravity, L_e is the effective distance of settling (= $2y$),