$$a_R = \frac{2\,\pi\,\omega^2\,S\,(\theta}{)^2}$$

Construction of cam profile for a Radial cam

In order to draw the cam profile for a radial cam, first of all the displacement diagram for the given motion of the follower is drawn. Then by constructing the follower in its proper position at each angular position, the profile of the working surface of the cam is drawn.

In constructing the cam profile, the principle of kinematic inversion is used, i.e. the cam is imagined to be stationary and the follower is allowed to rotate in the opposite direction to the cam rotation.

Examples based on cam profile

Draw the profile of a cam operating a knife-edge follower having a lift of 30 mm. the cam raises the follower with SHM for 150⁰ of the rotation followed by a period of dwell for 60⁰. The follower descends for the next 100⁰ rotation of the cam with uniform velocity, again followed by a dwell period. The cam rotates at a uniform velocity of 120 rpm and has a least radius of 20 mm. what will be the maximum velocity and acceleration of the follower during the lift and the return?

- S = 30 mm : Øa = 150^0 ; N = 120 rpm ;
- $\delta_1 = 60°$; r_c = 20 mm : $\delta_2 = 50°$
- **During ascent:**

$$\omega = \frac{2\,\pi\,N}{60} = \frac{2\,\pi \times 120}{60} = 12.57\,rad/s$$

$$v_{max} = \frac{\pi \times \omega \times s}{2\,\theta_0} = \frac{\pi \times 12.57 \times 30}{2 \times 150 \times \frac{\pi}{180}} = 226.3$$

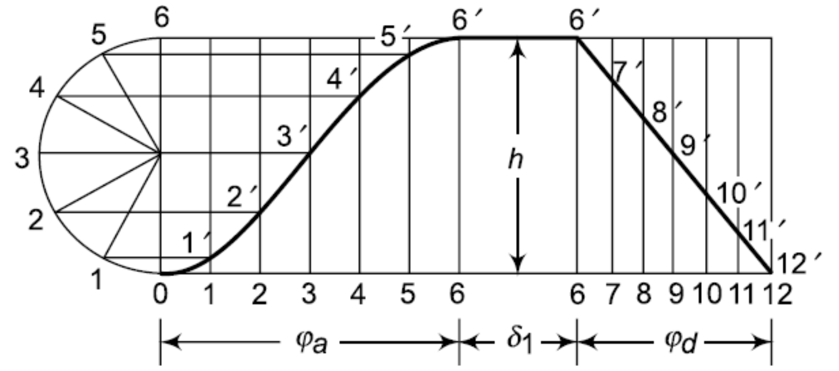
$$a_{max} = \frac{\pi^2 \times \omega^2 \times s}{2 \times (\theta^0)^2} = \frac{\pi^2 \times 12.57^2 \times 30}{2 \times (150 \times \frac{\pi}{180})^2} = 7.413\ m/s^2$$

- **During descent:**

$$v_{max} = \frac{\omega\,S}{\emptyset_d}$$

$$v_{max} = \frac{12.57 \times 30}{100 \times \frac{}{180}} = 216\ mm/s$$

$$\boldsymbol{f_{max} = 0}$$



(a)

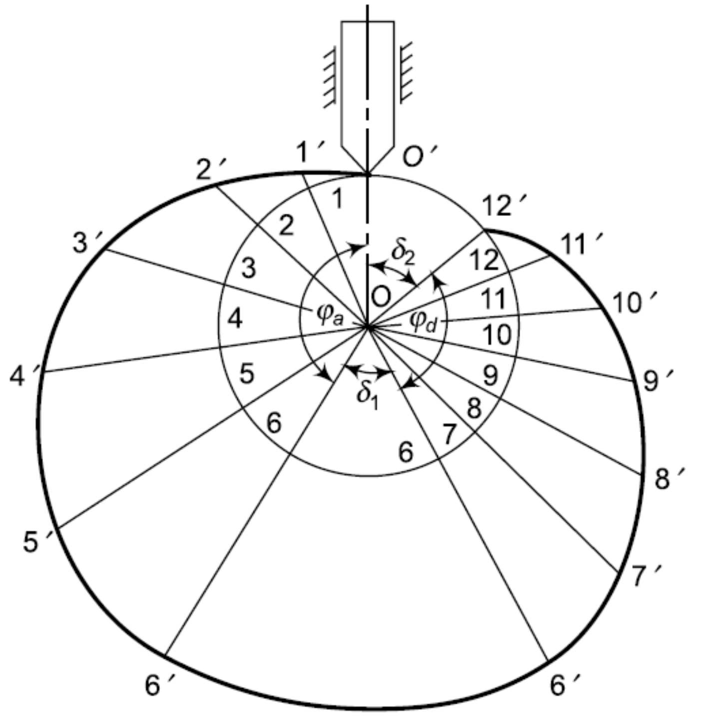


Fig. 4.10

A cam with a minimum radius of 25 mm is to be designed for a knife-edge follower with the following data:

To raise the follower through 35 mm during 60⁰ rotation of the cam

Dwell for next 40⁰ of the cam rotation

Descending of the follower during the next 90⁰ of the cam rotation

Dwell during the rest of the cam rotation

Draw the profile of cam if the ascending and descending of the cam with simple harmonic motion and the line of stroke of the follower is offset 10 mm from the axis of the cam shaft.

What is the maximum velocity and acceleration of the follower during the ascent and the descent if the cam rotates at 150 rpm?

– S = 35 mm : $Ø_a = 60^o$; N = 150 rpm ;

– $\delta_1 = 40°$; $r_c = 25$ mm : $Ø_d = 90^o$; x = 10 mm

- **During ascent:**

$$\omega = \frac{2\pi N}{60} = \frac{2\pi \times 150}{60} = 5\pi \ \frac{rad}{s}$$

$$v_{max} = \frac{\pi \times \omega \times s}{2\,\theta_0} = \frac{\pi \times 5\pi \times 35}{2 \times 150 \times \frac{\pi}{180}} = 827.7\ mm/s$$

$$a_{max} = \frac{\pi^2 \times \omega^2 \times s}{2 \times (\theta_0)^2} = \frac{\pi^2 \times (5\pi)^2 \times 35}{2 \times (150 \times \frac{\pi}{180})^2} = 38.882\ m/s^2$$

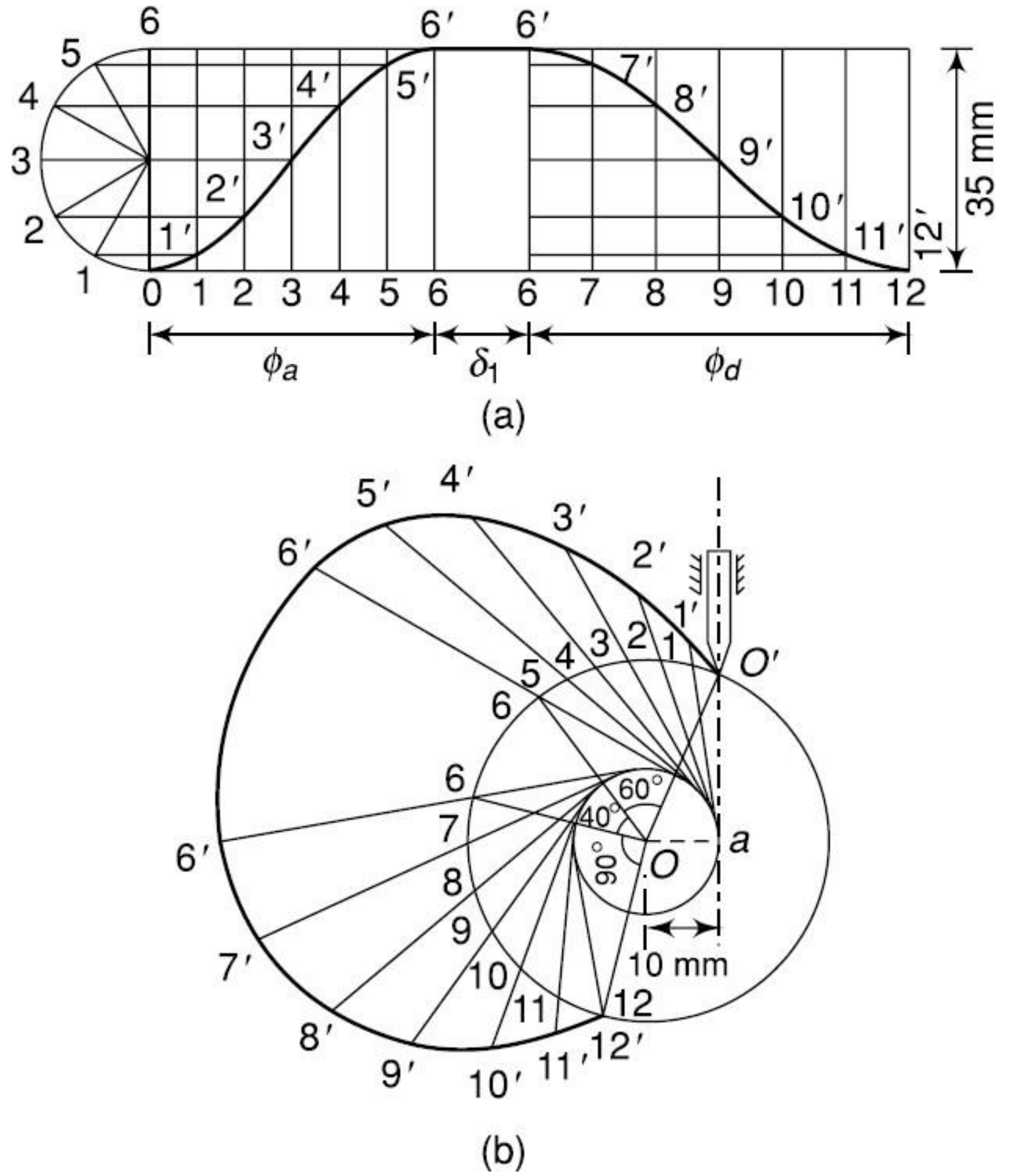


Fig. 7.11

- **During descent:**

$$v_{max} = \frac{\pi \times \omega \times s}{2\,\theta_0} = \frac{\pi \times 5\pi \times 35}{2 \times 90 \times \frac{\pi}{180}} = 549.80\ mm/s$$