


FIGURE 7-15

Undercutting due to negative radius of curvature used with flat-faced follower

lower, we can formulate a relationship from this equation that will predict the minimum base circle radius R_b needed to avoid undercutting. The only factor on the right side of equation 7.19 that can be negative is the acceleration, a . We have defined s to be always positive, as is R_b . Therefore, the worst case for undercutting will occur when a is near its **largest negative value**, a_{min} , whose value we know from the a diagram. The minimum base circle radius can then be defined as:

$$R_{b_{min}} > \rho_{min} - (s + a)_{min} \quad (7.20)$$

Because the value of a_{min} is negative and it is also negated in equation 7.20, it dominates the expression. To use this relationship, we must choose some minimum radius of curvature ρ_{min} for the cam surface as a design parameter. Since the hertzian contact stresses at the contact point are a function of local radius of curvature, that criterion can be used to select ρ_{min} . That topic is discussed in Chapter 12.

Note that none of the equations developed above for this case involves the **eccentricity**, ϵ . It is only a factor in cam size when a roller follower is used. It does not affect the geometry of a flat follower cam.

Figure 7-15 shows the result of trying to use a flat-faced follower on a cam whose theoretical path of follower point P has negative radius of curvature due to a base circle radius that is too small. If the follower tracked the path of P as is required to create the motion function defined in the s diagram, the cam surface would actually be as developed by the envelope of straight lines shown. But, these loci of the follower face are cutting into cam contours that are needed for other cam angles. The line running through the forest of follower loci is the path of point P needed for this design. The undercutting can be clearly seen as the crescent-shaped missing pieces at four places between the path of P and the follower face loci. Note that if the follower were zero width (at point P), it would work kinematically, but the stresses would be a bit high, in fact infinite.