CHAPTER 8

Cams

Advantages and Disadvantages

Cams, like ratchets, are very popular intermittent motion devices; but the two are rarely competitors for the same jobs. Like ratchets, cams are very simple mechanisms, at least they involve very few parts. Unlike ratchets, however, cams give the designer great freedom in his choice of motion patterns. Acceleration, velocity, and displacement can all be manipulated and controlled by the cam designer.

Other general advantages which can be obtained with cam systems are such things as:

a. High load-carrying ability
b. Low shock and acceleration—virtual elimination of impact
c. Very long life
d. High reliability
e. Quiet operation.

Disadvantages are less easy to find. The best cam systems require a rotary input; this is not a disadvantage to a machine designer, but it is for a mechanism or instrument designer, in many cases. A second, and more pertinent disadvantage is the fact that a cam must be manufactured with great precision in order to realize its full potential. Again, this is not a serious drawback when a heavy duty and/or sophisticated machine is involved, because the advantages offered by cams are worth their cost, but it can be a disadvantage in other areas if production quantities preclude precision casting, etc. Cam shapes are complex and good cams are costly. But many companies make them and superb manufacturing equipment is readily available.

Driver and Driven Members

In the best cam systems, the cam, itself, is the driver and a reciprocating or pivoted arm is the follower. Figure 8–1 is an example of such a cam system. The lobed member is the driver and the group of rollers is the follower. In this case, two drivers are used to keep the follower system under positive control at all times. (See also Fig. 8–23.)

It is also possible for a follower to drive a cam as in Fig. 8–2. Generally speaking, this class of cam systems is less desirable than the first, as far as acceleration patterns, etc., are concerned, but they find many applications. I think, for example, that the Geneva might be considered as a cam system of this class: but it is so important as an indexing device that we will devote a separate chapter to it later. The "inverse escapement" is also a follower-driven cam system. This mechanism is covered at length in the chapter on escapements.

Machine design handbooks often discuss the pressure angle between a cam and its follower. Such treatments are always related to the first class of cam systems in which the cam drives the follower. If the follower is mounted in slide bearings it is essential that the resultant forces generated by the cam on the follower deviate as little as possible from the axis of the follower. 30 degrees is usually considered a maximum pressure angle in a practical