

## Clutch and Brake Systems

### Systems Versus Components

Most of the mechanisms that have been discussed up to this point produce intermittent motion without any assistance from other components. A Geneva, for example, converts the continuously rotating motion of an input shaft into intermittent motion to drive a load. No external controls, or the like, are needed for the Geneva to perform its designed task. On the other hand, clutches and brakes, are components which, taken alone, usually cannot produce intermittent motion. They are used instead as building blocks of larger systems involving control components, etc.; without these additional components the clutch-brake combination will produce either continuous motion or no motion.

A clutch is a device used to connect one shaft to another, usually connecting a load to a driver on command. A brake is a device used to connect a shaft to ground for stopping or holding that shaft. Usually it is the load shaft which is provided with the brake. Clutches and brakes are very similar devices and, in many cases, are identical to each other in construction. They can be obtained as separate components and provided with separate and independent controls by the system designer. Since they are so frequently used together, however, they can also be purchased as combined clutch-brake components and often with predesigned control packages. Examples of these various products will be seen in this chapter.

### Types

There are many different types of clutches and brakes. It would be possible, in fact, to write a separate book on this subject alone. I hope it will be sufficient for our purposes to say that some clutches and brakes have toothed mating surfaces; some rely on friction (disc or spring clutches and brakes); some make use of wedging or toggle forces (and friction) to grip the output member (sprag, roller, or cam clutches and brakes); and some rely on magnetic or electrical forces to produce the drive or braking torque (hysteresis, eddy current, magnetic powder and magnetic fluid clutches). Most of these various types can be actuated by either mechanical, electrical, pneumatic, or hydraulic means, depending on the system in which they are used.

### Systems

Clutch-brake combinations are used in two basically different ways in intermittent motion drives. They are used alone (with suitable control means) to produce intermittent motion where high-precision positioning is not required. When high precision is required, they are used with precision mechanical indexers; Genevas, ratchets, star wheels, gears, etc. Their main function in this second case is to extend dwell periods while permitting fast and precise indexing during drive periods.

Figures 13-1 through 13-8 will describe and illustrate next, a number of different basic clutch-brake

