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TYPE, NUMBER, AND DIMENSIONAL SYNTHESIS

5-1 KINEMATIC SYNTHESIS

The study of motions in machines may be considered from the two different points of view generally identified as kinematic analysis and kinematic synthesis. Kinematic analysis is the determination of the motion inherent in a given machine or mechanism. Formerly displacement analysis was of paramount interest, and it still may be. However, increases in rotational speeds have made a knowledge of velocity and acceleration characteristics critical factors in the design of the many elements comprising the complete machine. Inertia forces deriving from the accelerations may be several times as large as the static forces. In consequence, cross-section dimensions of links and bearing selection are contingent upon acceleration magnitudes and directions. Kinematic synthesis is the reverse problem: it is the determination of mechanisms that are to fulfill certain motion specifications. Synthesis is the very fundamental of design, for it represents the creation of new hardware to meet particular needs in motion—displacement, velocity, or acceleration—singly or in combination. Some typical examples of kinematic synthesis are given in the following:

