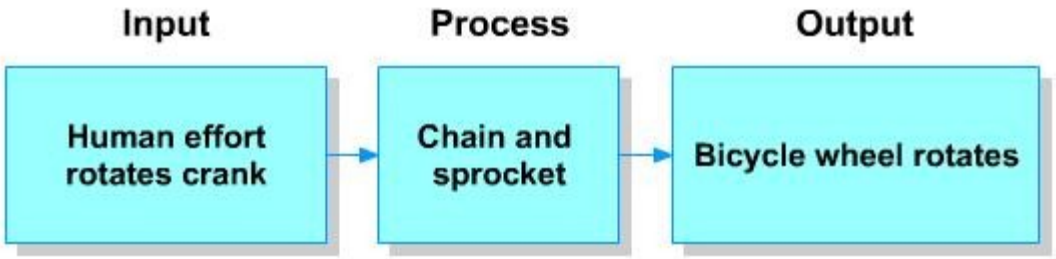
Chain and Sprocket

Introduction

The output from power sources such as electric motors, car engines and wind generators is rotary motion of a drive shaft. The output rotary motion and force must be transmitted from the power source to a mechanism that will use the energy in some way. The usual ways of transmitting motion and force from the output drive shaft to a shaft in a mechanism is through:

- gears
- belt and pulleys
- chain and sprockets
- crank
- coupling.

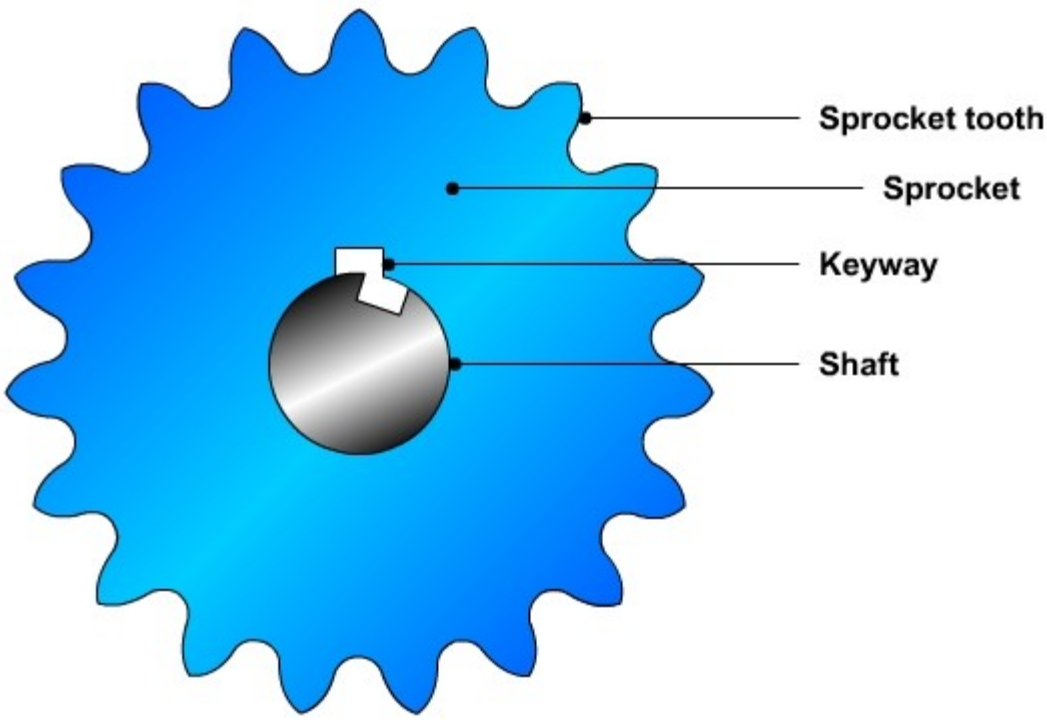
This section will explain how motion and force is transmitted from the output shaft of a power source through a chain and sprocket to other parts of a mechanism.



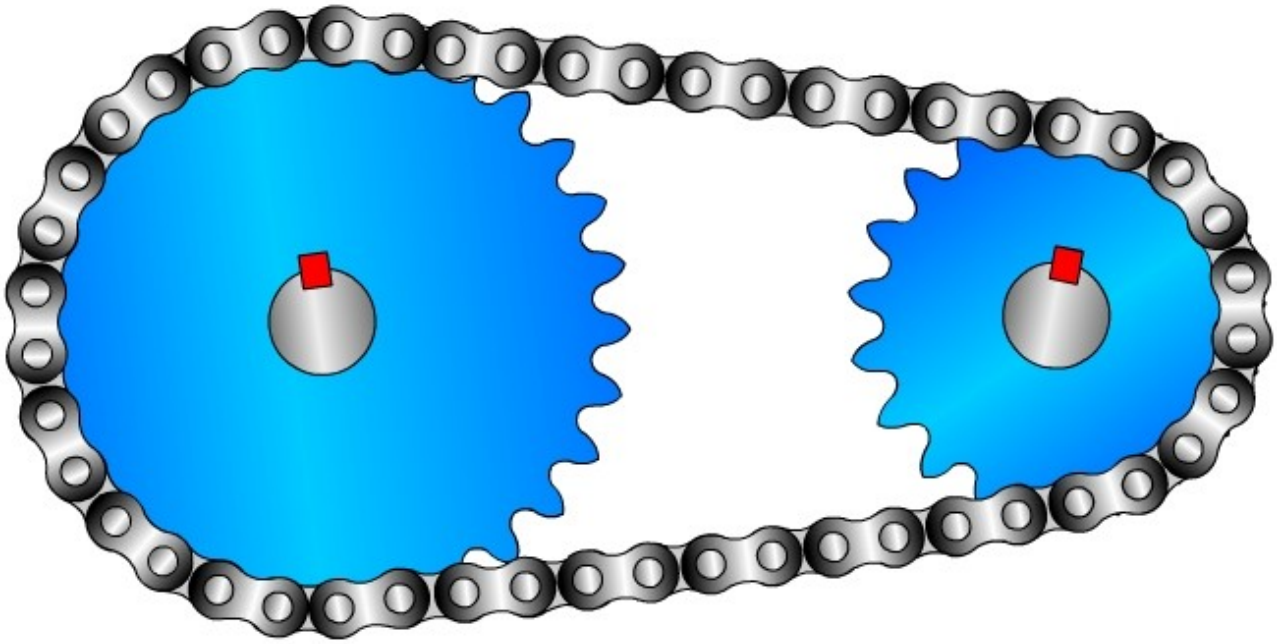
Chain and Sprocket

A sprocket is a toothed wheel that is used to transmit motion and torque from one shaft to another. Chains that are used to transmit motion and force from one sprocket to another are called **power transmission chains.** Unlike gears that have to mesh to transmit motion and torque from one gear to another, sprockets may be positioned far apart. Sprockets are connected by a chain.

A sprocket with a hole that matches the diameter of the shaft is chosen and slid onto the shaft. The sprocket is then rotated until the keyways in the sprocket and shaft line up. A rectangular piece of steel bar called a key is slid into the keyways to prevent the sprocket from spinning on the shaft.



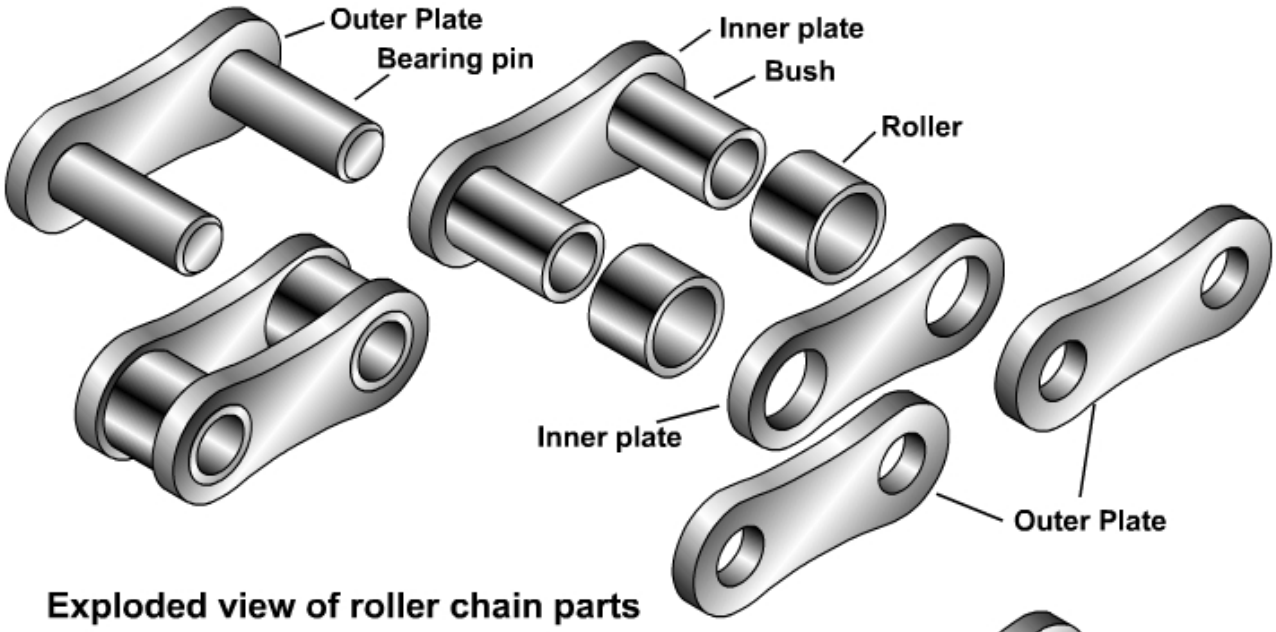
Chain and sprocket mechanisms perform the same task as a belt and pulley system, i.e. they transfer motion and force from one shaft to another. A belt can slip on a pulley but the teeth on the sprocket prevent the chain from slipping. A chain and sprocket is used wherever a positive, non-slip drive is required, e.g. bicycles, motorcycles, forklift mechanisms, and the camshaft drives in car petrol engines.



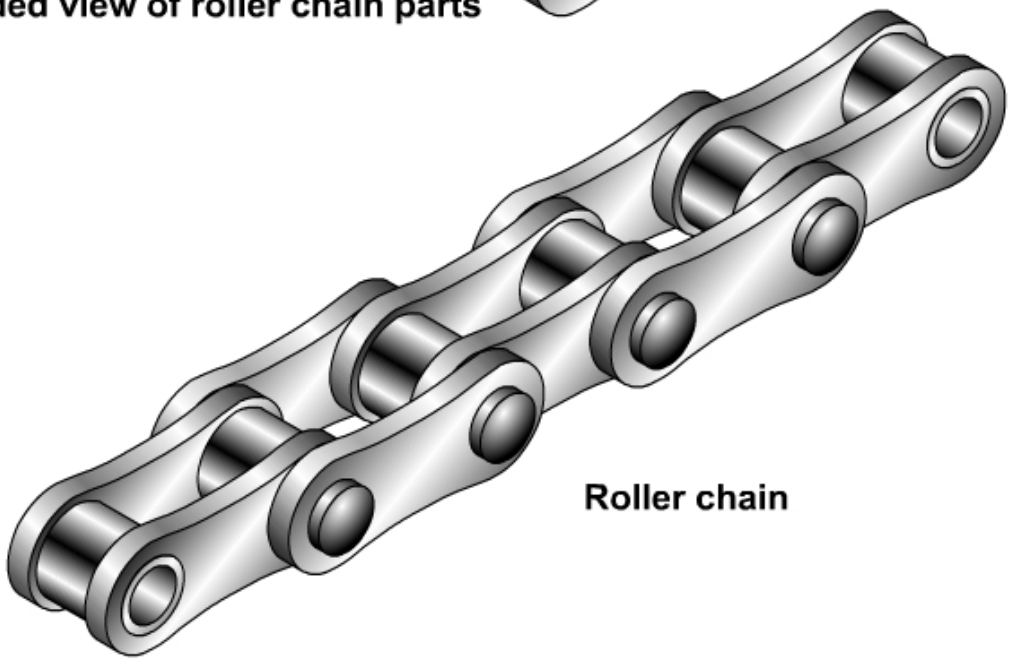
There are 6 major groups of power transmission chains:

- standard general purpose roller chains, widely used in industry
- high performance roller chains, these roller chains are stronger than general purpose roller chains
- lube-free chains, these chains can be used without lubrication
- environmentally resistant chains with special corrosion resistance
- specialty chains, Type 1, used as bicycle chains, motor cycle chains, automotive chains
- specialty chains, Type 2, including miniature chains, leaf chains and inverted tooth chain, i.e. silent chains.

Most of these chains are the roller type, i.e. they are composed of link plates, pins that join the link plates and also rollers and bushes.



Exploded view of roller chain parts



Roller chain

Advantage of chain drives

An advantage of chain drives over most belt drives is that the chain cannot slip on the sprocket, so the chain and sprocket provides a positive, non-slip drive, i.e. the chain cannot slip on the sprocket because the sprocket teeth prevent the chain from slipping.

Some belt and pulley drives also have teeth. These toothed belt and pulley drives are used in applications where it is important that the belt does not slide on the pulley, e.g. timing belts in internal combustion engines and the drive belts that replace the chain on some motorcycles.

Disadvantage of chain drives

The disadvantage of the chain and sprocket drive is that it can be noisy and more expensive than a belt and pulley drive system.

Chain and sprocket drives are not used on some applications such as drilling machines and lathes precisely because the chain and sprocket drive does not allow slip. For safety reasons, belt and pulley drives are used on many machines so that in the event of something jamming in the machine, under great pressure, the belt can slip on the pulley rather than damaging the machine as would happen with a no-slip chain and sprocket drive.

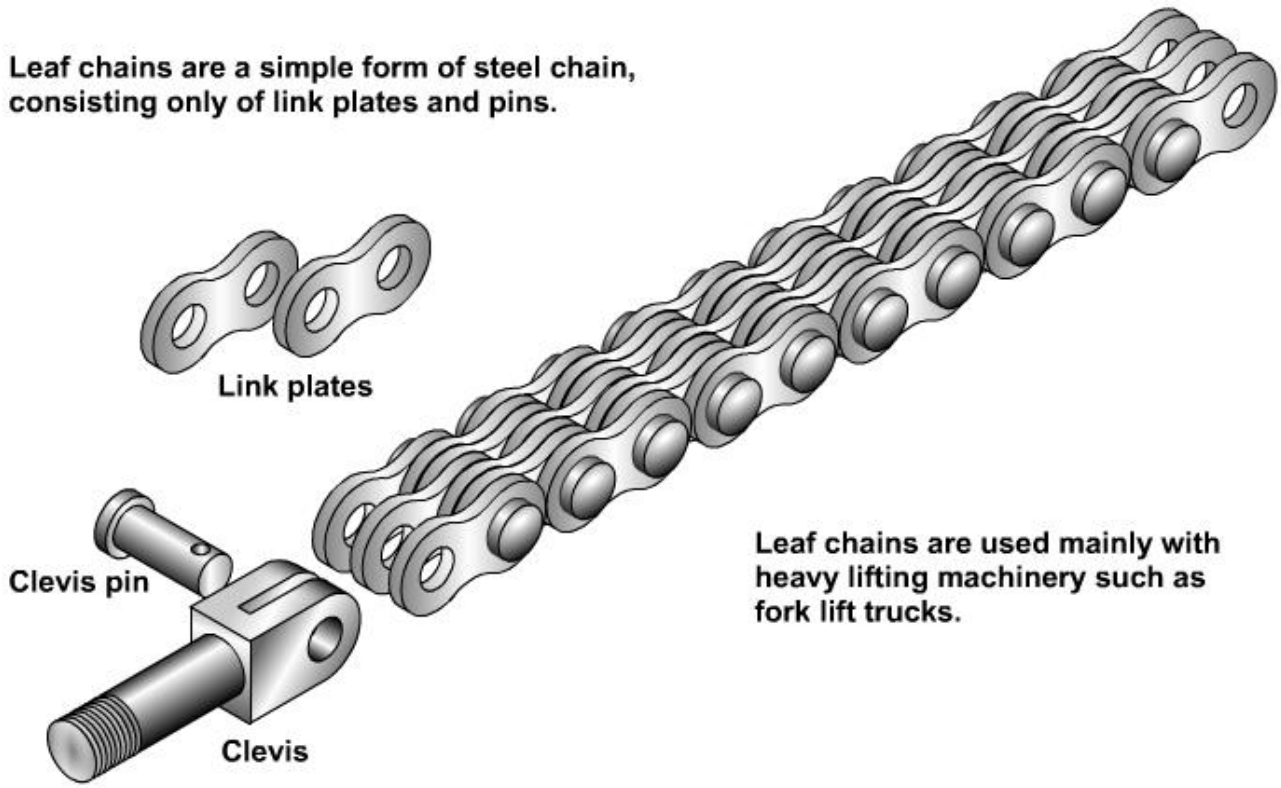
Chain and sprocket drives are used in applications where slipping should not occur, e.g.

- bicycles and motor cycles
- cam shaft drives in internal combustion engines
- fork lift trucks
- elevators and escalators.

Leaf Chains

Leaf chains are a simple form of steel chain, consisting only of link plates and pins. Leaf chains are very strong, generally having greater tensile strength than roller chains. There are no rollers or bushes in leaf chains, simply links plates connected by pins. This means that leaf chains must be lubricated regularly and must only be used for low speed applications such as raising and lowering the forks of a fork lift truck.

Leaf chains run over sheaves, (which are similar to pulleys) rather than over sprockets. The chain is fitted with a clevis at each end held in place by a clevis pin. The clevis is used to fix the chain to other parts of machinery, often hauling and lifting systems.



Special Chains

There are variations of the basic link and pin system of chains, with the modifications making the chain suitable for applications such as chain saws, escalators and conveyors.