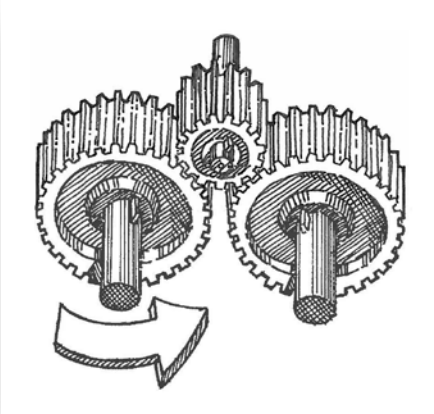
Basic Gear Systems

A number of gears connected together is called a “Gear Train”. The gear train is another mechanism for transmitting rotary motion and torque. Unlike a belt and pulley, or chain and sprocket, no linking device (belt or chain) is required. Gears have teeth which interlock (or mesh) directly with one another.



Advantages

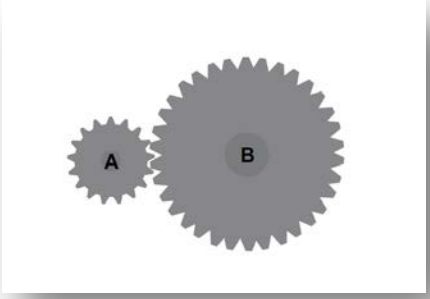
The main advantages of gear train transmission systems are that because the teeth on any gear intermesh with the next gear in the train, the gears can't slip. (An exact ratio is maintained.) Large forces can be transmitted. The number of turns a gear makes can be easily controlled. High ratios between the input and the output are easily possible.

Disadvantages

The main disadvantage of a gear system is it usually needs a lubrication system to reduce wear to the teeth. Oil or grease is used to reduce friction and heat caused by the teeth rubbing together.

Gear systems to increase and decrease rotational velocity

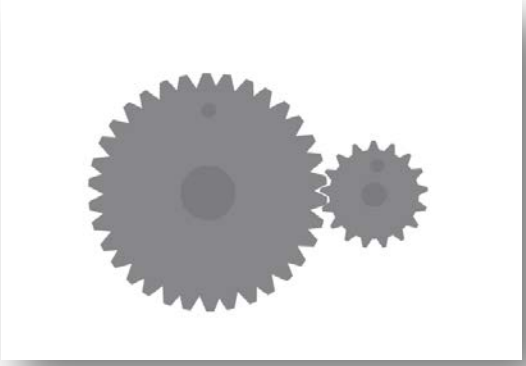
Gears are used to increase or decrease the speed or power of rotary motion. The measure of how much the speed or power is changed by a gear train is called the gear ratio (velocity ratio). This is equal to the number of teeth on the driver gear divided by the number of teeth on the driven gear.



To decrease the speed of the output the driver gear is smaller than the driven gear.

(This will reduce the speed but increase the “torque”.)

This diagram shows a small gear (A) driving a larger gear (B). Because there are more teeth on the driven gear there is a reduction in output speed.



To increase the speed of the output the driver gear is larger than the driven gear.

(This will increase the speed of the output but decrease the “torque”.)

This diagram shows a large driver gear (A) driving a smaller driven gear (B). Because there are less teeth on the driven gear there is an increase in output speed.