Worm gear

Worm gears resemble screws. A worm gear is usually meshed with an ordinary looking, disk-shaped gear, which is called the *gear*, *wheel*, or *worm wheel*.

Worm-and-gear sets are a simple and compact way to achieve a high torque, low speed gear ratio. For example, helical gears are normally limited to gear ratios of less than 10:1 while worm-and-gear sets vary from 10:1 to 500:1.[A disadvantage is the potential for considerable sliding action, leading to low efficiency.

28. **Inter changeable gears, gear tooth action, Terminology:**
    - Inter changeable gears
    - Gear tooth action
    - Terminology

29. **Interference and undercutting:**
    - Interference in involute gears
    - Methods of avoiding interference
    - Back lash

30. **Non standard gear teeth: Helical, Bevel, Worm, Rack and Pinion gears (Basics only)**
    - Helical
    - Bevel
    - Worm
    - Rack and Pinion gears

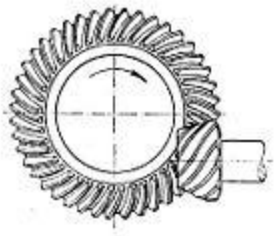
Worm

Worm gears can be considered a species of helical gear, but its helix angle is usually somewhat large (close to 90 degrees) and its body is usually fairly long in the axial

direction; and it is these attributes which give it its screw like qualities. The distinction between a worm and a helical gear is made when at least one tooth persists for a full rotation around the helix. If this occurs, it is a 'worm'; if not, it is a 'helical gear'. A worm may have as few as one tooth. If that tooth persists for several turns around the helix, the worm will appear, superficially, to have more than one tooth, but what one in fact sees is the same tooth reappearing at intervals along the length of the worm. The usual screw nomenclature applies: a one-toothed worm is called *single thread* or *single start*; a worm with more than one tooth is called *multiple thread* or *multiple start*. The helix angle of a worm is not usually specified. Instead, the lead angle, which is equal to 90 degrees minus the helix angle, is given.

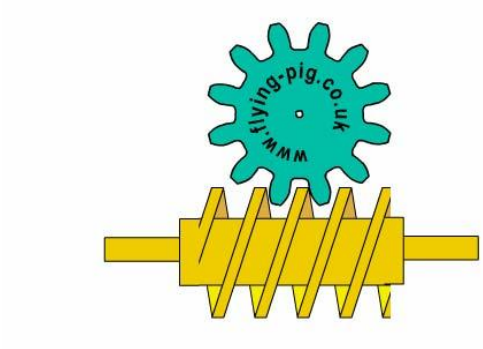
In a worm-and-gear set, the worm can always drive the gear. However, if the gear attempts to drive the worm, it may or may not succeed. Particularly if the lead angle is small, the gear's teeth may simply lock against the worm's teeth, because the force component circumferential to the worm is not sufficient to overcome friction. Worm-and-gear sets that do lock are called **self locking**, which can be used to advantage, as for instance when it is desired to set the position of a mechanism by turning the worm and then have the mechanism hold that position. An example is the machine head found on some types of stringed instruments.

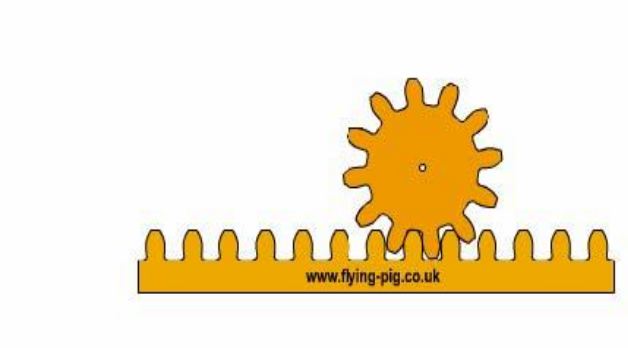
If the gear in a worm-and-gear set is an ordinary helical gear only a single point of contact will be achieved. If medium to high power transmission is desired, the tooth shape of the gear is modified to achieve more intimate contact by making both gears partially envelop each other. This is done by making both concave and joining them at a saddle point; this is called a **cone-drive**.



RACK AND PINION

WORM GEAR





RACK AND PINION: The rack and pinion is used to convert between rotary and linear motion. The rack is the flat, toothed part, the pinion is the gear. Rack and pinion can convert from rotary to linear of from linear to rotary. The diameter of the gear determines the speed that the rack moves as the pinion turns. Rack and pinions are commonly used in the steering system of cars to convert the rotary motion of the steering wheel to the side to side motion in the wheels. Rack and pinion gears give a positive motion especially compared to the friction drive of a wheel in tarmac. In the rack and pinion railway a central rack between the two rails engages with a pinion on the engine allowing the train to be pulled up very steep slopes.

WORM GEAR: A worm is used to reduce speed. For each complete turn of the worm shaft the gear shaft advances only one tooth of the gear. In this case, with a twelve tooth gear, the speed is reduced by a factor of twelve. Also, the axis of rotation is turned by 90 degrees. Unlike ordinary gears, the motion is not reversible, a worm can drive a gear to reduce speed but a gear cannot drive a worm to increase it. As the speed is reduced the power to the drive increases correspondingly. Worm gears are a compact, efficient means of substantially decreasing speed and increasing power. Ideal for use with small electric motors.

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