Gears and gearing

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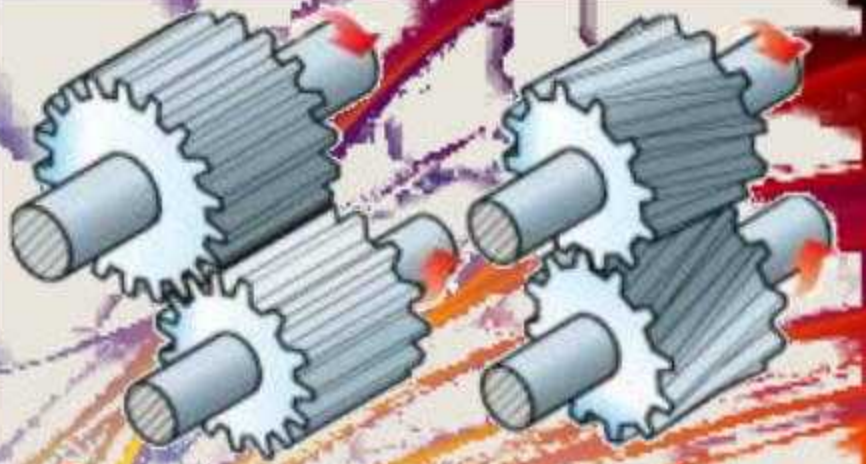
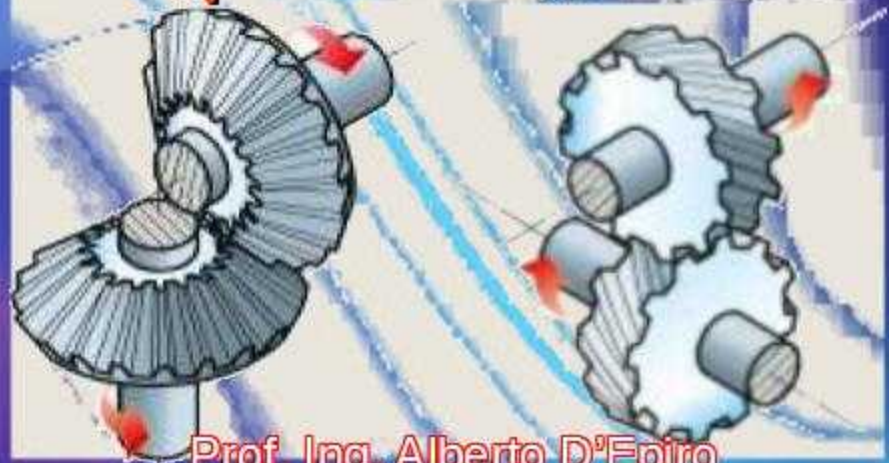


Gears are used to transmit power from one shaft to another and are now used in practically every complicated machine.



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The gear that is connected to the source of power is called the driver, and the one that receives power from the driver is the driven gear. It always rotates in a direction opposing that of the driving gear; if both gears have the same number of teeth, they will rotate at the same speed.

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"High" Gearing to increase driven gear velocity

"Low" Gearing to increase torque

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However, if the number of teeth differs, the gear with the smaller number of teeth will rotate faster.

The Idler Gear changes the direction of the driven gear

Gears are versatile mechanical components capable of performing many different kinds of power transmission or motion control.
Examples of these are:

- changing rotational speed;
- changing rotational direction;
- changing the angular orientation of rotational motion;
- multiplication or division of torque.

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Gear types

All gears can be classified as either external gear or internal or annual gears:

- external, gears have teeth on the outside surface of the disk or wheel;
- internal or annual, gears have teeth on the inside surface of a ring or cylinder.

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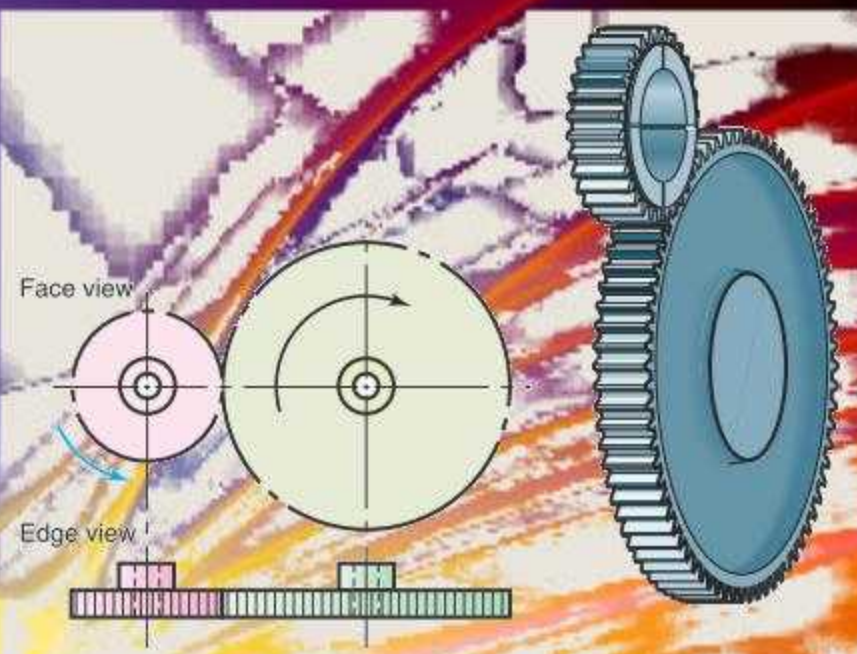
There are a variety of types.

1) **Spur gear**, the teeth are straight and parallel to the shaft axis. Transmits power and motion between rotating two parallel shafts.



Features

the most common type of gear;

there are no axial forces;

easy to manufacture;

Applications

transmission components

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2) Helical gear, the teeth are twisted oblique to the gear axis. The hand of helix is designed as either left or right. Right-hand and left-hand helical gears mate as a set. But they must have the same helix angle

Features

- has higher strength compared with a spur gear;
- more effective in reducing noise and vibration when compared with a spur gear;
- gears in mesh produce thrust forces in the axial direction.

Applications

transmission components, automotive, speed reducers

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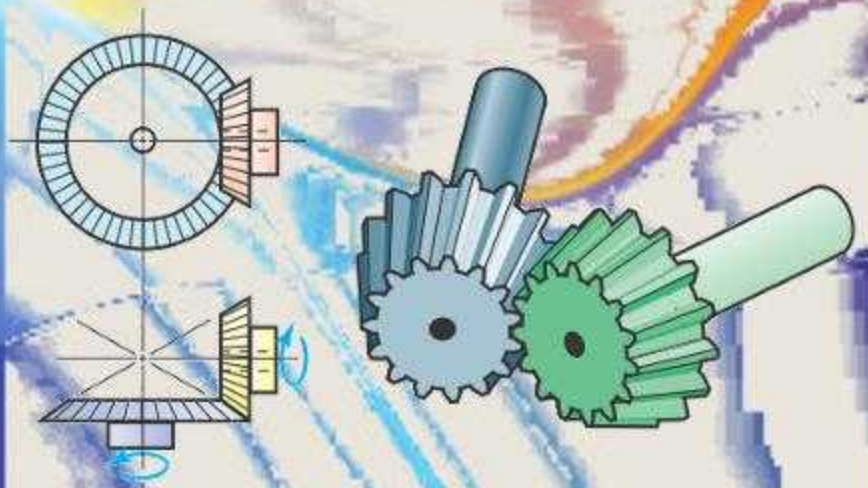
3) Bevel gear

One of a pair of gear used to connect two shafts whose axes intersect, and the pitch surfaces are cones.
Theeth are cut along the pitch cone.
Depending on tooth trace, bevel gears are classified as:

a) Straight bevel gear;
b) Spiral bevel gear.

3a) Straight bevel gear

A simple form of bevel gear having straight teeth which, if extended inward, would come together at the intersetion of the shaft axes.



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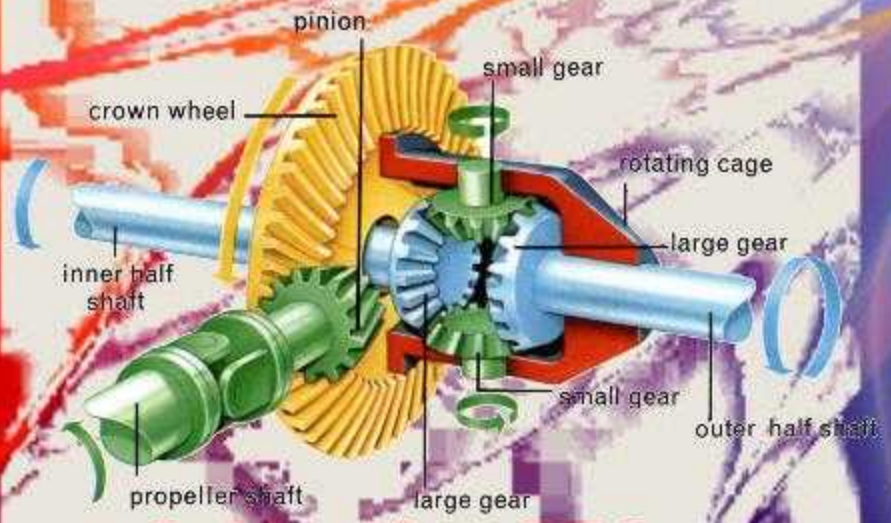
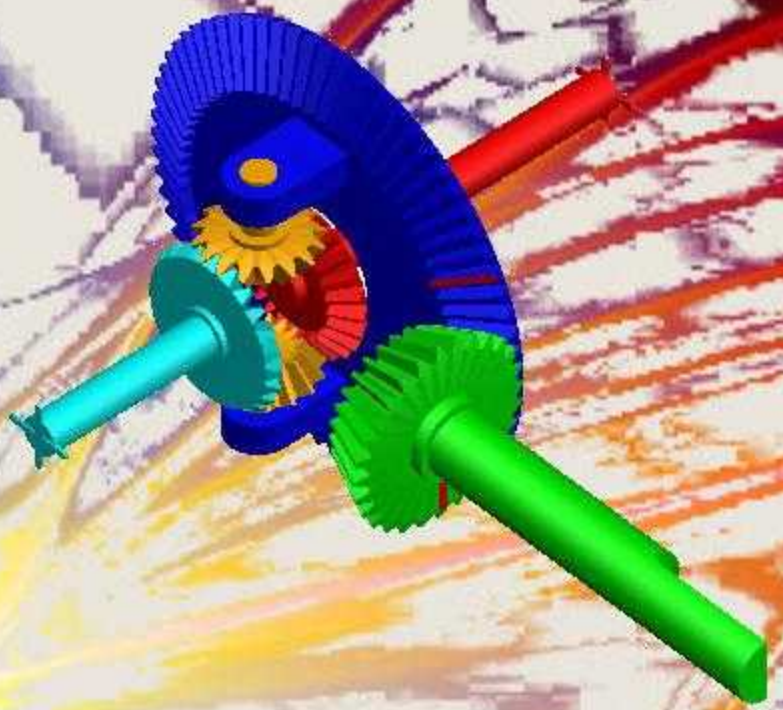
Features

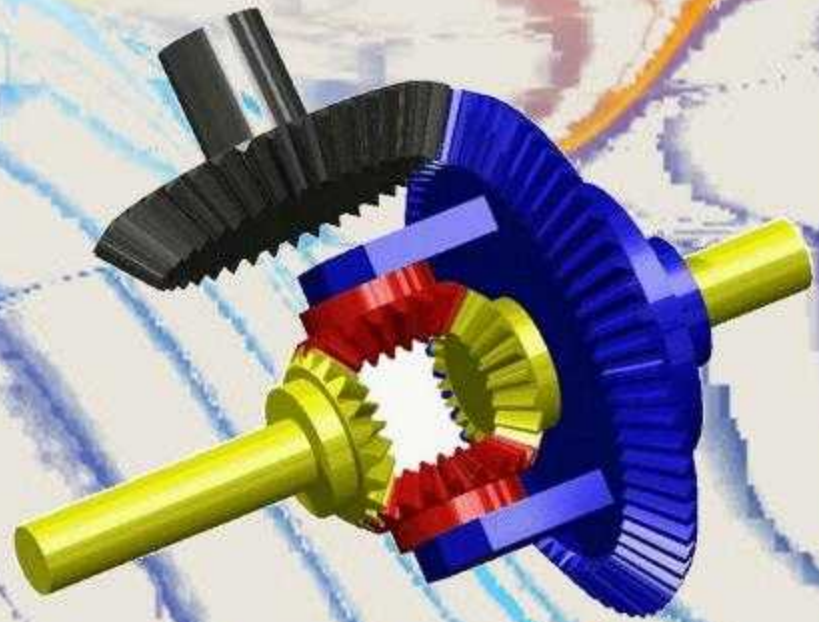
- Relatively easy to manufacture;
- Provides reduction ratios up to approx. 1:5

Applicazions

Machine tools, printing presses, etc. Especially suitable for use as a differential gear unit.







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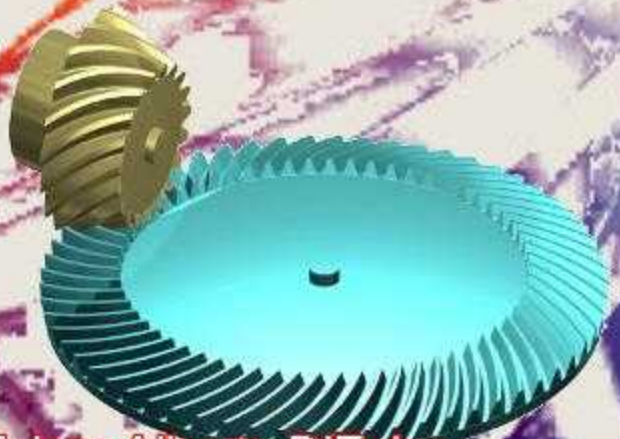
3b) Spiral Bevel gear

Bevel gear with curved, oblique teeth to provide gradual engagement and larger contact surface at a given time than an equivalent straight bevel gear.

gearing for ships. Especially suitable for high-speed, heavy load drives.



Features

- has higher contact ratio, higher strength and durability than an equivalent straight bevel gear;
- allows a higher reduction ratio;
- has better efficiency of transmission with reduced gear noise;
- involves some technical difficulties in manufacturing

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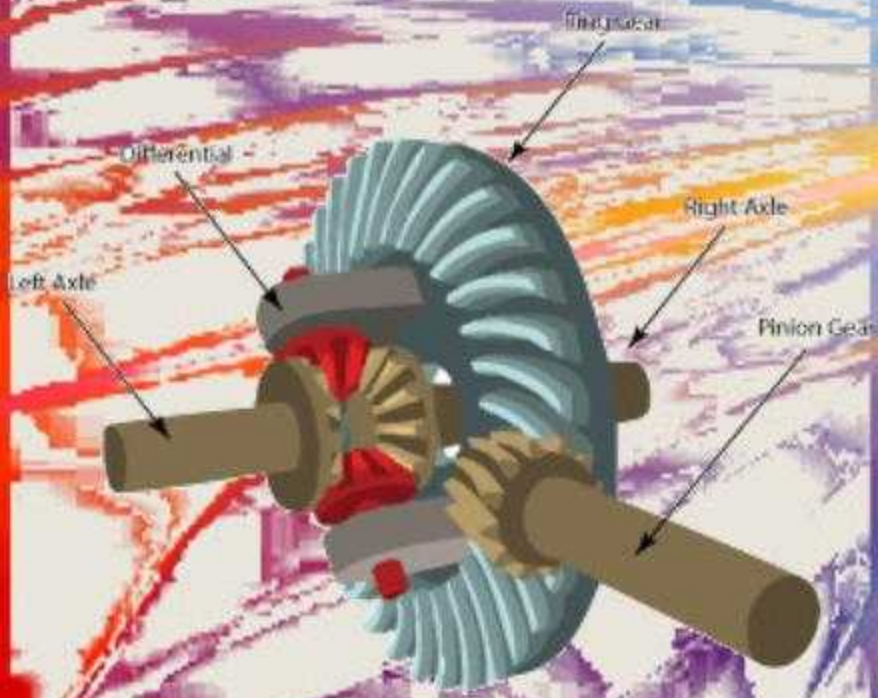
Applications

Automobiles, tractors, vehicles, final reduction gearing for ships.

Especially suitable for high-speed, heavy load drives.



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Miter gears

A special class of bevel gear where the shafts intersect at 90° and the gear ratio is 1:1. It is used to change the direction of shaft rotation without change in speed.

Screw gears

A helical gear that transmits power from one shaft to another, non parallel, non intersecting shaft.

Features

- Can be used as a speed reducer or as a speed increaser;
- Not suitable for transmission of high horsepower.

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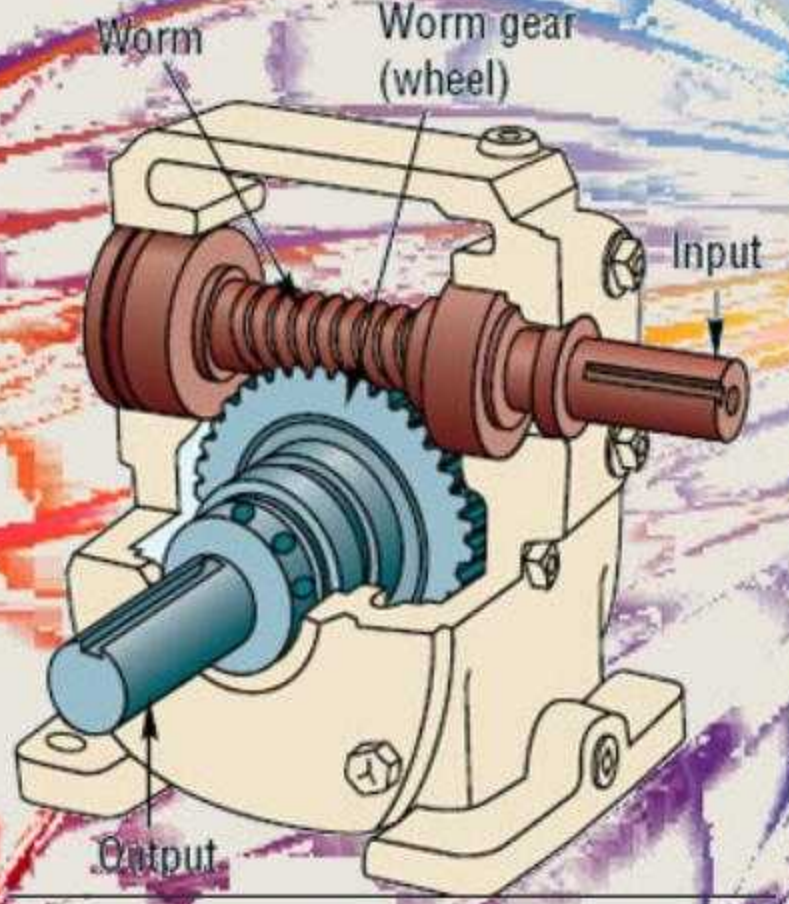
Applications

Driven gear for automobile, automatic machine that require intricate movements.



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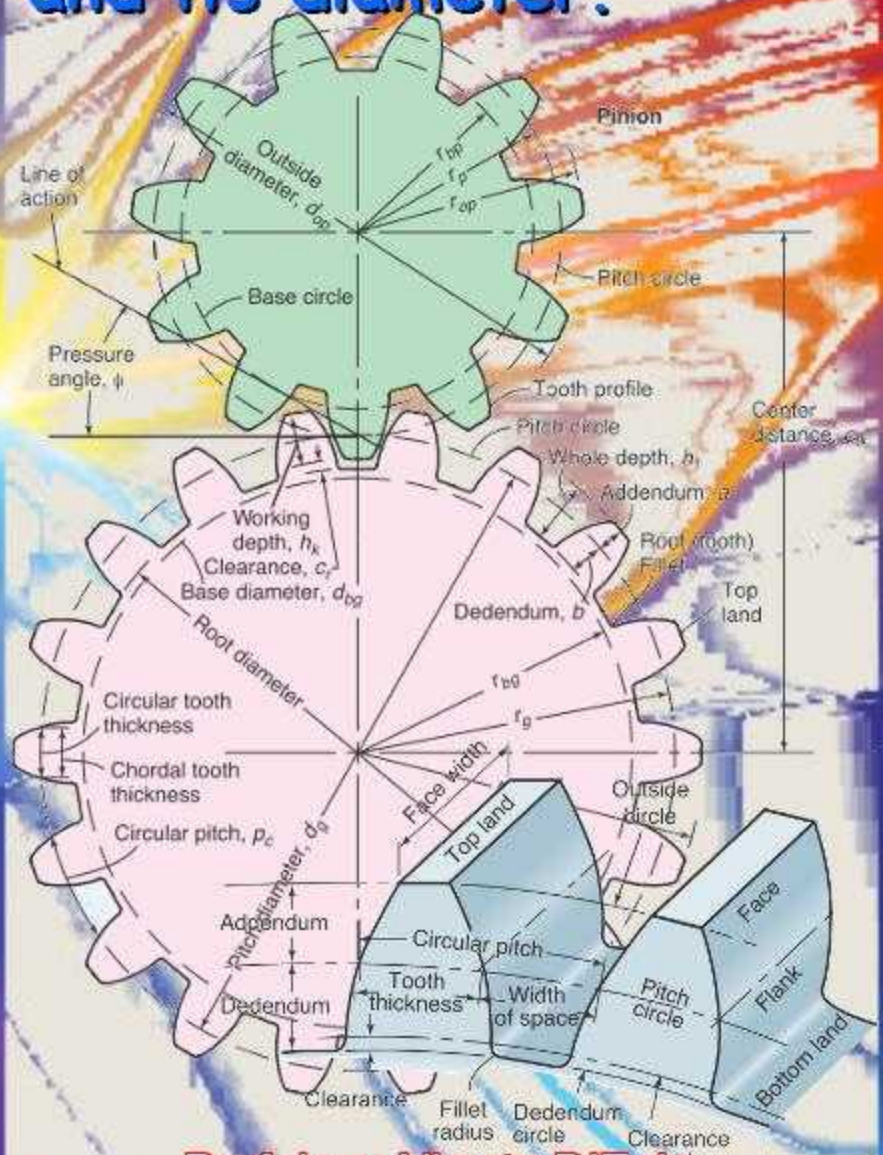
Gear geometry

The gear is defined by the number of its teeth and its diameter.



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Pitch circle, a theoretical circle upon which all calculations are based.

Pitch diameter, the diameter of the pitch circle, the imaginary circle that rolls without slipping with the pitch circle of the mating gear, measured in inches or millimeters.

Addendum, is the height by which a tooth projects beyond the pitch circle or pitch line.

Dedendum circle, the theoretical circle through the bottom lands of a gear.

Dedendum, the radial distance between the pitch circle and the dedendum circle. This distance is measured in inches or millimeters.

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