Gear Trains

Kinematics of Machinery

Prof. Momin Md. Nafe

- Sometimes, two or more gears are made to mesh with each other to transmit power from one shaft to another. Such a combination is called **gear train or train of toothed wheels.**

- The nature of the train used depends upon the velocity ratio required and the relative position of the axes of shafts.

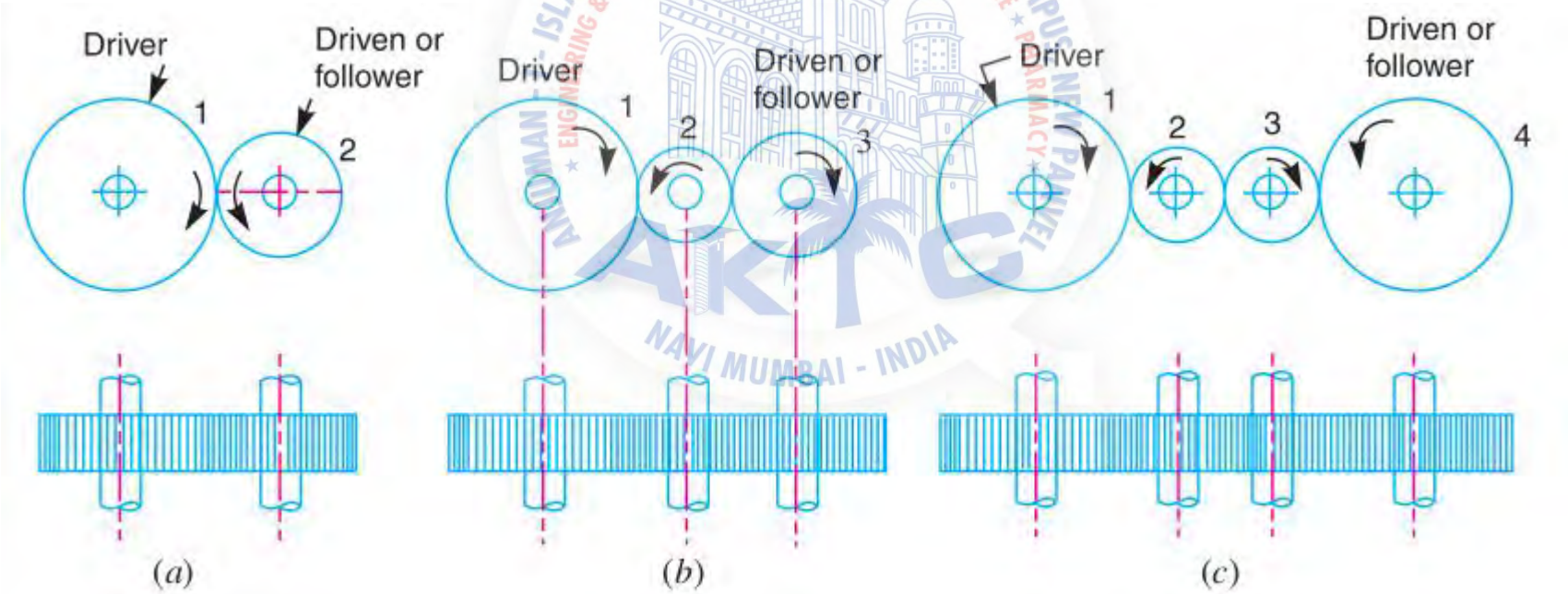
- Gear train may consist of spur, bevel or spiral gears.

T ypes of Gear T rains

- 1. Simple gear train
- 2. Compound gear train
- 3. Re-verted gear train
- 4. Epicyclic gear train.

Simple Gear Train

- When there is only one gear on each shaft, it is known as simple gear train. The gears are represented by their pitch circles.

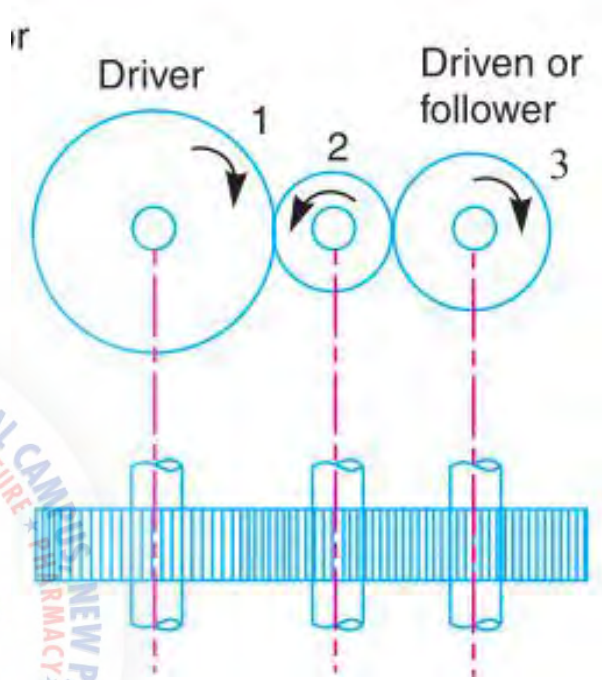


$$\frac{N_1}{N_2} = \frac{T_2}{T_1}$$

$$\frac{N_2}{N_3} = \frac{T_3}{T_2}$$

$$\frac{N_1}{N_2} \times \frac{N_2}{N_3} = \frac{T_2}{T_1} \times \frac{T_3}{T_2}$$

$$\frac{N_1}{N_3} = \frac{T_3}{T_1}$$

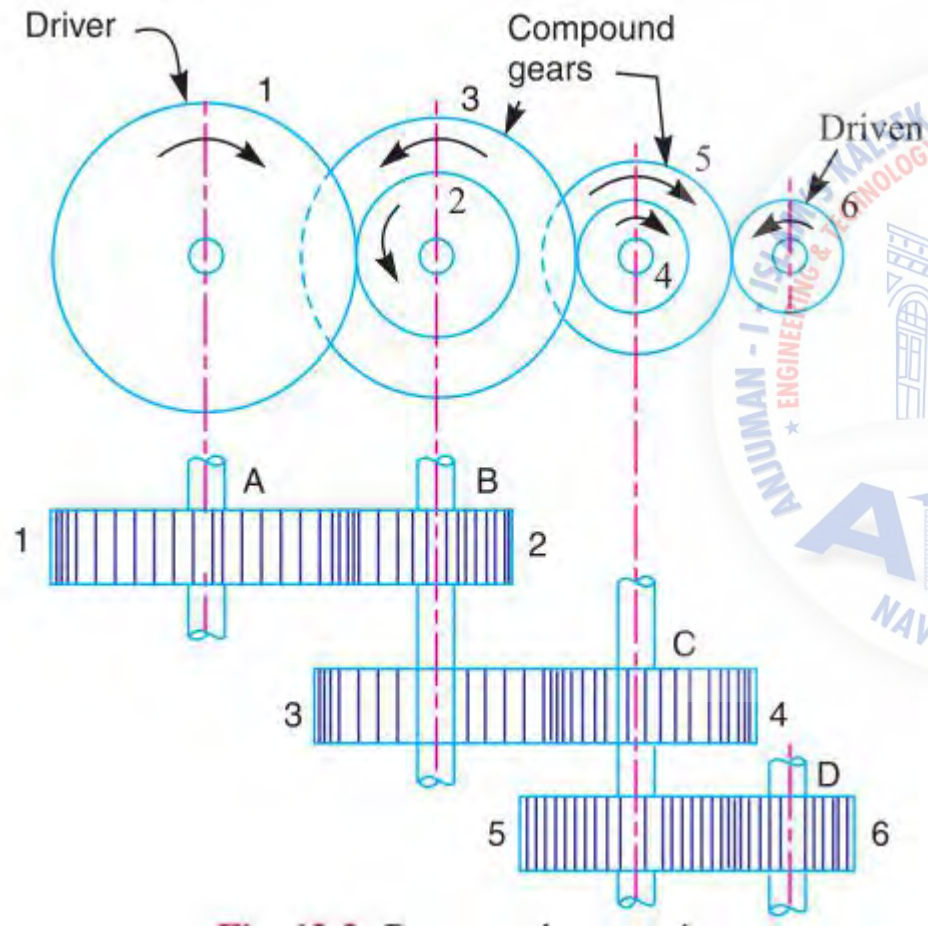


$$\text{Speed ratio} = \frac{\text{Speed of driver}}{\text{Speed of driven}} = \frac{\text{No. of teeth on driven}}{\text{No. of teeth on driver}}$$

$$\text{Train value} = \frac{\text{Speed of driven}}{\text{Speed of driver}} = \frac{\text{No. of teeth on driver}}{\text{No. of teeth on driven}}$$

Compound Gear Train

- When there are more than one gear on a shaft, as shown in Fig. it is called a compound train of gear.



$$\frac{N_1}{N_2} = \frac{T_2}{T_1}$$

$$\frac{N_3}{N_4} = \frac{T_4}{T_3}$$

$$\frac{N_5}{N_6} = \frac{T_6}{T_5}$$

$$\frac{N_1}{N_2} \times \frac{N_3}{N_4} \times \frac{N_5}{N_6} = \frac{T_2}{T_1} \times \frac{T_4}{T_3} \times \frac{T_6}{T_5}$$

$$\frac{N_1}{N_6} = \frac{T_2 \times T_4 \times T_6}{T_1 \times T_3 \times T_5}$$

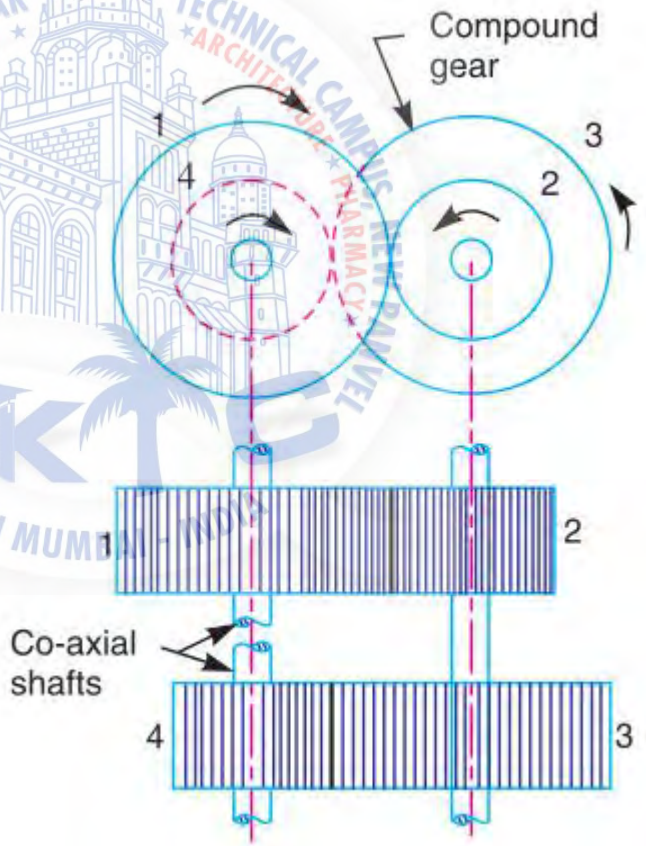
Reverted Gear Train

When the axes of the first gear (i.e. first driver) and the last gear (i.e. last driven or follower) are co-axial,

then the gear train is known as reverted gear train as shown in Fig.

r1+ r2= r3 +r4

T1 + T2= T3 + T4



$$\text{Speed ratio} = \frac{\text{Product of number of teeth on drivens}}{\text{Product of number of teeth on drivers}}$$

$$\frac{N_1}{N_4} = \frac{T_2 \times T_4}{T_1 \times T_3}$$

$$\text{Speed ratio} = \frac{\text{Speed of the first driver}}{\text{Speed of the last driven or follower}}$$

$$= \frac{\text{Product of the number of teeth on the drivens}}{\text{Product of the number of teeth on the drivers}}$$

$$\text{Train value} = \frac{\text{Speed of the last driven or follower}}{\text{Speed of the first driver}}$$

$$= \frac{\text{Product of the number of teeth on the drivers}}{\text{Product of the number of teeth on the drivens}}$$