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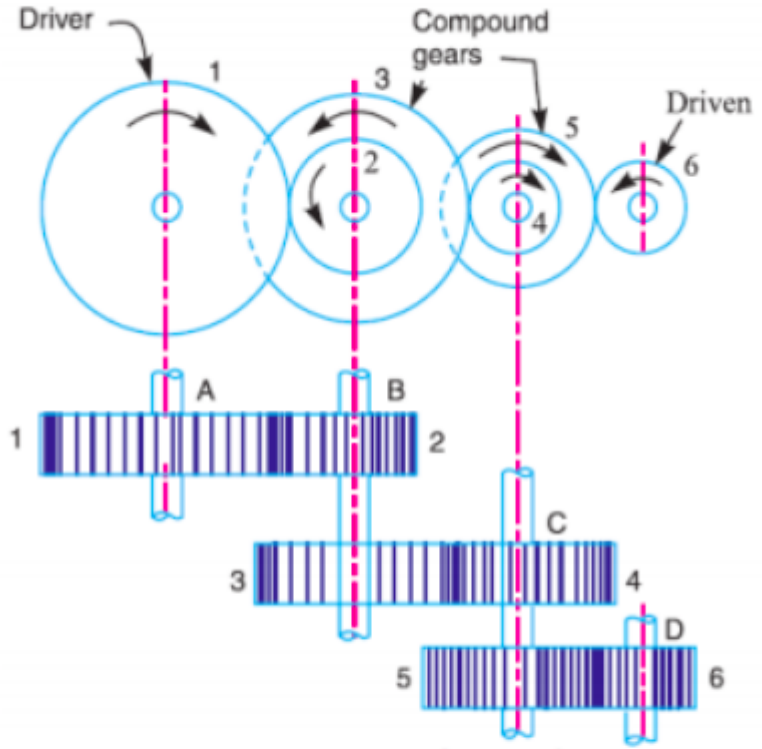
Explain the compound gear train with neat sketch and write down the velocity ratio’s equation.

Question:
Explain the compound gear train with neat sketch and write down the velocity ratio’s equation.

Answer:

Compound gear train

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



Compound gear train.

In a compound train of gears, as shown in Fig., the gear 1 is the driving gear mounted on shaft A, gears 2 and 3 are compound gears which are mounted on shaft B. The gears 4 and 5 are also compound gears which are mounted on shaft C and the gear 6 is the driven gear mounted on shaft D.

Let N1= Speed of driving gear 1, T1= Number of teeth on driving gear 1,

N2,N3..., N6= Speed of respective gears in r.p.m., and

T2,T3..., T6= Number of teeth on respective gears.

Since gear 1 is in mesh with gear 2, therefore its speed ratio is

$$\frac{N_1}{N_2} = \frac{T_2}{T_1} \qquad \text{...(i)}$$

Similarly, for gears 3 and 4, speed ratio is

$$\frac{N_3}{N_4} = \frac{T_4}{T_3} \qquad \text{...(ii)}$$

and for gears 5 and 6, speed ratio is

$$\frac{N_5}{N_6} = \frac{T_6}{T_5} \qquad \text{...(iii)}$$

The speed ratio of compound gear train is obtained by multiplying the equations (*i*), (*ii*) and (*iii*),

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

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

Since gears 2 and 3 are mounted on one shaft B, therefore $N_2 = N_3$.
Similarly gears 4 and 5 are mounted on shaft C, therefore $N_4 = N_5$.

i.e. Speed ratio $= \dfrac{\text{Speed of the first driver}}{\text{Speed of the last driven or follower}}$

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

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

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