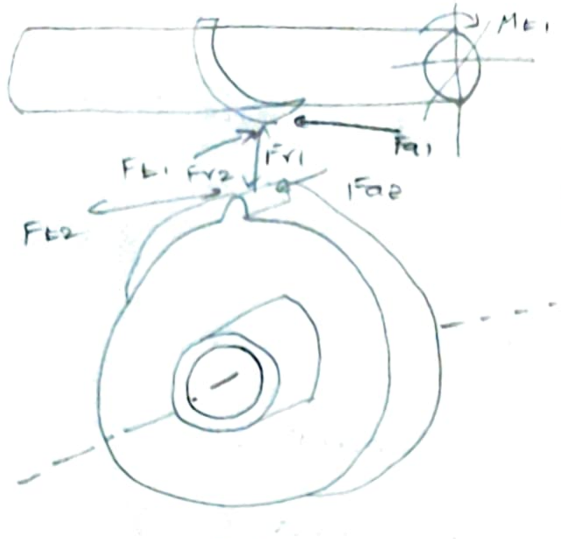
FORCE ANALYSIS ON WORM GEARING:-

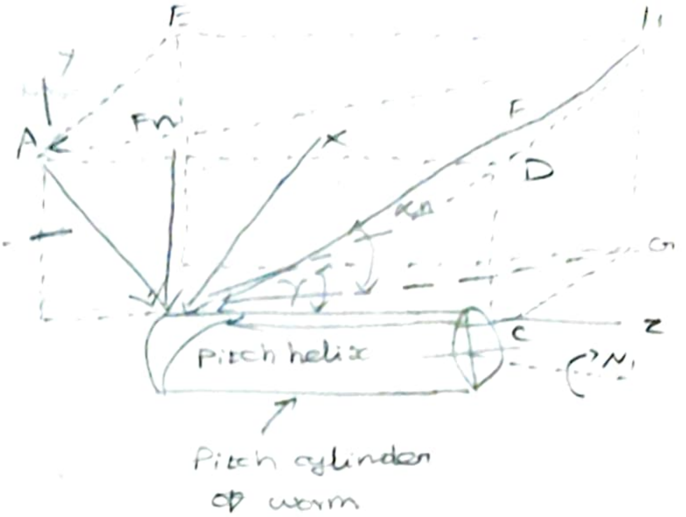
As discussed earlier, in the force Analysis of worm gearing, it is assumed that the worm is the driving member while the worm wheel is the driven member. Illustrates the ~~three~~ components of the gear tooth force acting on a worm and worm wheel.

F_{t1}, F_{r1} and F_{a1} => Tangential, radial and axial components of the worm respectively.

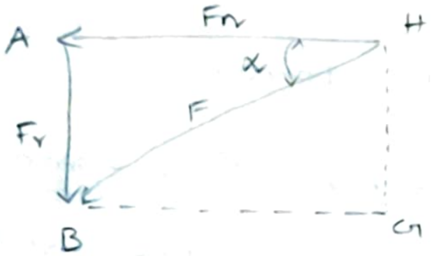
F_{t2}, F_{r2} and F_{a2} => Tangential, radial and axial components of the worm wheel respectively.



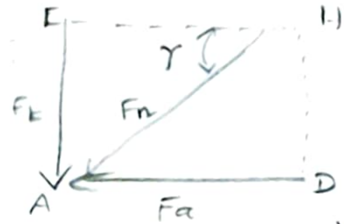
(a)

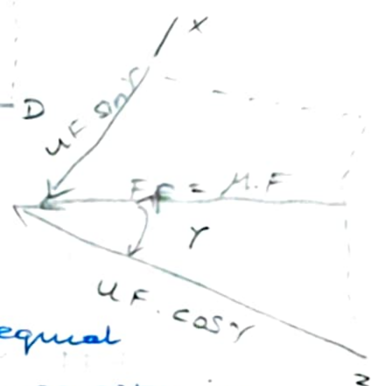


(b)



(c)





The forces on a worm wheel are equal in Magnitude to that of worm, but opposite in direction.

$$F_{t2} = -F_{a1}$$

$$F_{r2} = -F_{r1}$$

$$F_{a2} = -F_{t1}.$$

Derivations of F_t, F_r, F_a :- The Resultant force F acting on the tooth of a worm is Resolved into three component F_t, F_r and F_a.

α = Normal Pressure angle

γ = Lead angle

$$F_N = F\cos\alpha$$

$$F_r = F\sin\alpha$$

Resolving the component F_N in the plane ADHE, by referring.

$$F_t = F_N \cdot \sin\gamma$$

$$F_a = F_N \cdot \cos\gamma$$

Substituting equation i) and iii),

$$F_t = F \times \cos\alpha \cdot \sin\gamma$$

Now substituting equation i and iv), we get

$$F_a = F \times \cos\alpha \cdot \cos\gamma$$

$$F_a = F_t / \tan\gamma$$

$$F_r = F \times \sin\alpha = F_a \times \tan\alpha.$$

From these equations determine the components of the resultant tooth force, neglecting friction.

Efficiency of worm gearing :-

The efficiency of the worm gear drive is given by ...,

$$\eta = \frac{\text{Power output}}{\text{power input}}.$$

$$\eta = \frac{F_{t2} \times V_2}{F_{t1} \times V_1}$$

$$= \tan\gamma \times \frac{(\cos\alpha \cdot \cos\gamma - \mu \cdot \sin\gamma)}{(\cos\alpha \cdot \sin\gamma + \mu \cos\gamma)}$$

$$\Rightarrow \frac{(\cos\alpha - \mu \cdot \tan\gamma)}{(\cos\alpha + \mu \cdot \cot\gamma)}.$$

V_1, and V_2 = Pitch line velocity

(10) The variation of the co-efficient of friction with respect to rubbing velocity is shown in fig....