20-R-KM-DK-7

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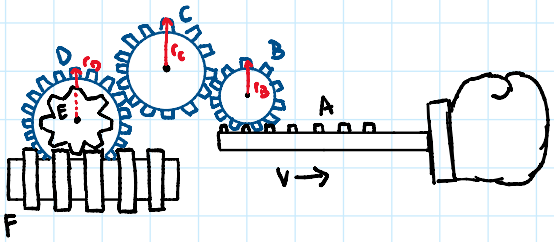
# 20-R-KM-DK-7 Intermediate Gear System

Inspiration: None




An engineer tries to be really funny and creates a prank punching machine. She wants to ensure the fist won't actually hurt anyone. She calculates that it will be perfectly safe as long as the boxing glove has a maximum velocity of ***v = 1 m/s***. What should the angular velocity of the worm gear (gear F) be to achieve this? Gear E is rigidly attached to gear D. For every 10 revolutions of gear F, gear E rotates once. Gears B, C, and D have radii ***r_B = 3 cm, r_C = 5 cm,*** and ***r_D = 6 cm*** respectively.

$v_A = v_B \quad v_B = \omega_B r \quad 1\ m/s = \omega_B(0.03\ m) \quad \omega_B = 33.\overline{33}\ rad/s$

$\omega_C r_C = \omega_B r_B \quad \omega_C = (33.\overline{33})\frac{3\ cm}{5\ cm} = 20\ rad/s$

$\omega_D r_D = \omega_C r_C \quad \omega_D = (20)\frac{5}{6} = 16.\overline{66}\ rad/s$

For every 10 revs of F, D rotates 1 rev $\Rightarrow$ 10x faster

$\omega_F = \omega_D \times 10 = \boxed{166.\overline{66}\ rad/s}$