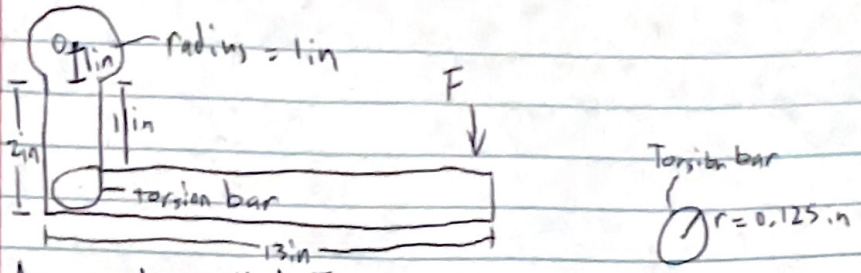

Assumed applied F = 20lb

Without torsion bar:

$M_o = 20(12) = 240 lbf \cdot in$

With no torsion bar, the clamp with have to withstand a moment of 240lbf·in estimated.

Torsion bar:

$\tau = \frac{Tr}{J}$

$J = \frac{\pi r^4}{2} = \frac{\pi (0.125)^4}{2} = 3.83 \cdot 10^{-4} \, in^4$

$\tau = \frac{Tr}{J}$

$\tau = \frac{(240 lbf \cdot in)(0.125 in)}{3.83 \cdot 10^{-4} in^4}$

$\tau = 78.23 \, kpsi$

If the load is transferred to a torsion bar, the bar will need to withstand 78.23 kpsi of shear stress. Analysis indicates the torsion bar will have to be much thicker.

If the diameter is increased to 0.75in, the stress is reduced to 362 psi