

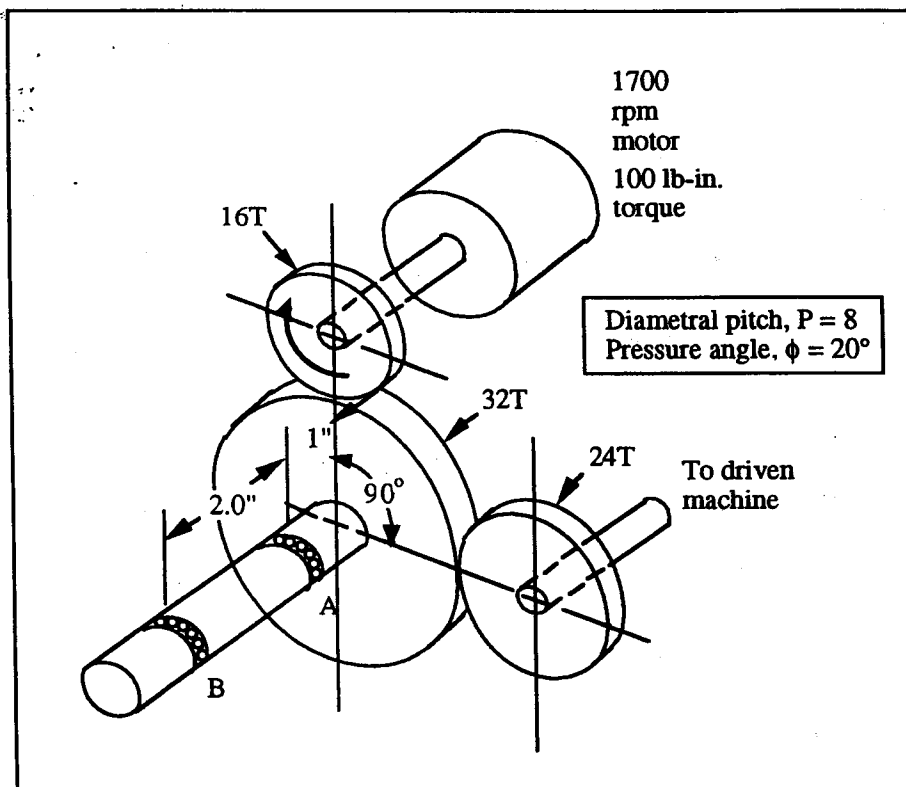
SOLUTION (15.27)

Known: Three spur gears transmit power from a motor shaft to a machine shaft in a given geometric arrangement. The middle gear acts as an idler and is supported by two bearings.

Find:

- Determine the radial load on idler shaft bearings for a given direction of motor shaft rotation.
- Determine the radial load on the bearings for the motor shaft rotation opposite to (a).
- Give an explanation as to why answers to (a) and (b) are different.

Schematic and Given Data:

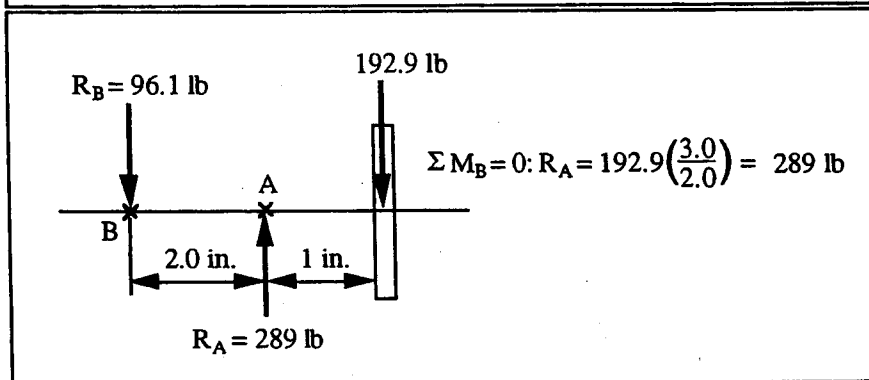
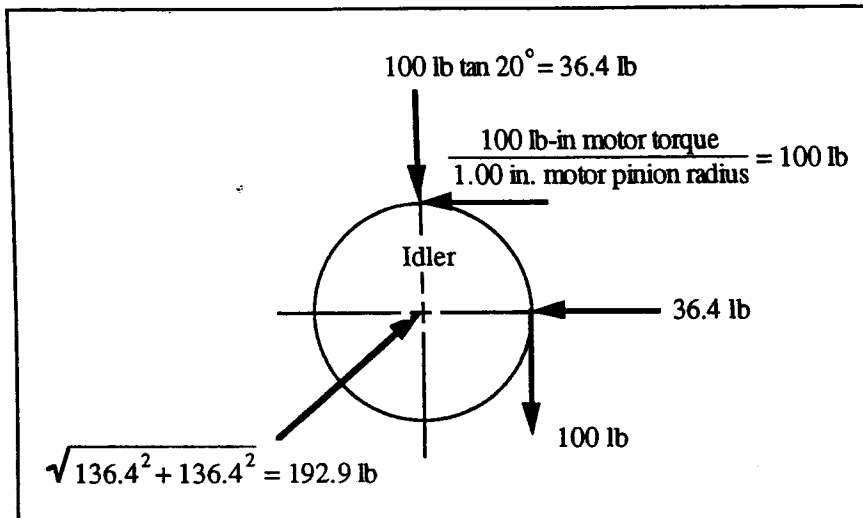


Assumptions:

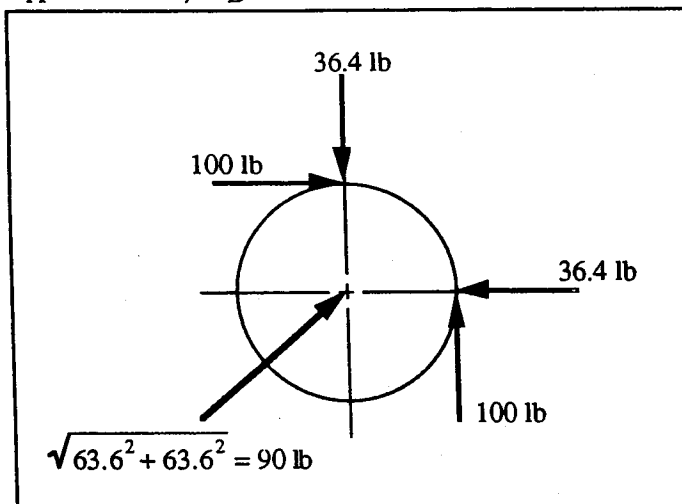
- The gears mesh along their pitch circles.
- All the gear tooth loads are static and are transmitted at the pitch point.
- Friction losses in the gears and bearings are negligible.
- Shaft bending deflections can be neglected.

Analysis:

(a) Pitch diameter of idler = $\frac{N}{P} = \frac{32}{8} = 4.0$ in.



- Bearing radial loads: $R_A = 289 \text{ lb}$, $R_B = 96.1 \text{ lb}$
 (b) Bearing loads are reduced by factor of $90/192.9$ to give:
 $R_A = 135 \text{ lb}$, $R_B = 45 \text{ lb}$



- (c) Reversing direction of rotation reversed tangential forces, causing tangential and radial components to subtract, rather than add.