Answer on Question#39212 – Physics – Other

A 33 kg gun is standing on a frictionless surface. The gun fires a 55.7 g bullet with a muzzle velocity of 318 m/s. The positive direction is that of the bullet. Calculate the momentum of the gun immediately after the gun was fired

Solution:

This is a conservation of momentum problem.

Before gun fires, the total momentum in the system is 0 (gun is standing). After the gun was fired, total momentum of the system is sum of momentum of the gun and momentum of the bullet (along X-axis):

$$\text{x: } 0 = \mathrm{p_{gun}} + \mathrm{p_{bullet}} \implies$$

$$\mathrm{p_{gun}} = -\mathrm{p_{bullet}} = -\mathrm{mv} = -55.7\ \times 10^{-3}\mathrm{kg} \cdot 318\frac{\mathrm{m}}{\mathrm{s}} = -17.7\ \mathrm{kg} \cdot \frac{\mathrm{m}}{\mathrm{s}}$$

Answer: momentum of the gun immediately after the gun was fired is equal to $-17.7\ \mathrm{kg} \cdot \frac{\mathrm{m}}{\mathrm{s}}$