Problem 7

A homogeneous ring lays horizontally on two identical parallel rails. The first rail moves parallel to itself, with a constant speed v; the second rail is at rest. The angular distance between the ring-rail contact points, as seen from the centre of the ring, is 2α for the first rail, and 2β for the second rail, see figure. Assuming that $\alpha \ll 1$ and $\beta = \pi/3$, find the speed of the centre of the ring.