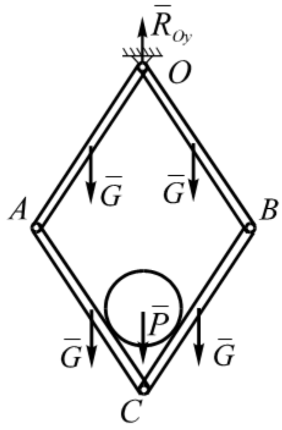
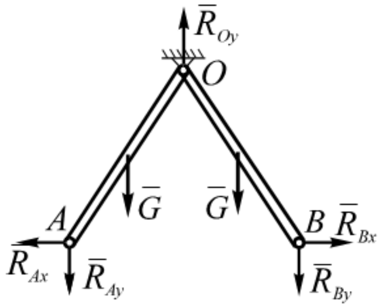
Problem S-2 2020



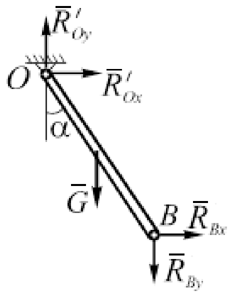
$$R_{Oy} = 4G + P$$



From the symmetry of the system

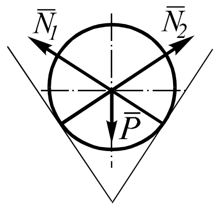
$$R_{Ay} = R_{By}$$

$$R_{Oy} = 2G + 2R_{Ay} \Rightarrow R_{Ay} = \frac{4G + P - 2G}{2} = G + \frac{P}{2}$$



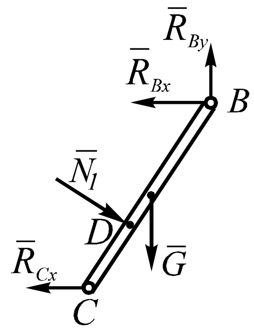
$$\sum M_{iO} = 0;\ R_{Bx} l \cos\alpha - G\frac{l}{2}\sin\alpha - R_{By} l \sin\alpha = 0$$

$$R_{Bx} = G\frac{\mathrm{tg}\alpha}{2} + R_{By}\,\mathrm{tg}\alpha = G\frac{\mathrm{tg}\alpha}{2} + G\,\mathrm{tg}\alpha + \frac{P}{2}\mathrm{tg}\alpha = (3G + P)\frac{\mathrm{tg}\alpha}{2}$$



$N_1 = N_2$ $\qquad P = 2N_1 \sin\alpha$

$$N_1 = \frac{P}{2\sin\alpha}$$



From the symmetry $R_{Cy} = 0$

$$\sum M_{iC} = 0;\ -N\frac{r}{\text{tg}\alpha} - G\frac{l}{2}\sin\alpha + R_{By}l\sin\alpha + R_{Bx}l\cos\alpha = 0$$

$$-\frac{P}{2\sin\alpha}\cdot\frac{r}{\text{tg}\alpha} - G\frac{l}{2}\sin\alpha + (G+\frac{P}{2})l\sin\alpha + (3G+P)\frac{\text{tg}\alpha}{2}l\cos\alpha = 0$$

$$-\frac{P\cos\alpha}{2\sin^2\alpha}r - G\frac{l}{2}\sin\alpha + Gl\sin\alpha + \frac{P}{2}l\sin\alpha + 3Gl\frac{\sin\alpha}{2} + Pl\frac{\sin\alpha}{2} = 0$$

$$\frac{P\cos\alpha}{2\sin^2\alpha}r = 2Gl\sin\alpha + Pl\sin\alpha$$

$$r = \frac{(2G+P)l\sin\alpha\cdot 2\sin^2\alpha}{P\cos\alpha}$$

$$d = 2r = \frac{4(2G+P)l\sin^3\alpha}{P\cos\alpha}$$

Если $d > l\cdot\sin 2\alpha$ (exceeds dimensions of the rhombus)

$$\frac{4(2G+P)l\sin^3\alpha}{P\cos\alpha} \geq 2l\sin\alpha\cos\alpha$$

$$\frac{4(2G+P)\sin^2\alpha}{P\cos\alpha} \geq 2\cos\alpha$$

$$\frac{2(2G+P)}{P}\sin^2\alpha \geq \cos^2\alpha$$

$$\text{tg}^2\alpha \geq \frac{P}{2(2G+P)}$$