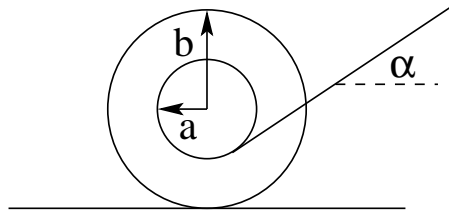


**[mex141] Reel of thread I: statics**

A reel of thread of weight  $W$  whose spindle and rim have radii  $a$  and  $b$ , respectively, rests on a horizontal table. The loose end of the thread passes under the spindle and leads off at an angle  $\alpha$  above the horizontal as shown. The static frictional force between the reel and the table is  $f \leq \mu_S N$ , where  $N$  is the normal force and  $\mu_S$  is a constant.

- (a) Find the angle  $\alpha_c$  at which a static equilibrium exists for nonzero tension  $T$  in the thread.
- (b) Find the maximum value  $T_c$  of the tension for which the equilibrium holds.



**Solution:**