ANSYS - Disks in Point Contact - Problem Specification

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Problem Specification

Consider two semicircular disks made of elastic material which are pressed together by forces P as shown in the figure below. The disks are initially in contact at a single point. The principal radii of curvature of the surface of the upper disk at the point of contact are R_1 and R_1'. Likewise, R_2 and R_2' are the principal radii of curvature of the surface of the lower disk at the point of contact. The line of action of force P lies along the axis that passes through the centers of curvature of the disks and through the point of contact.
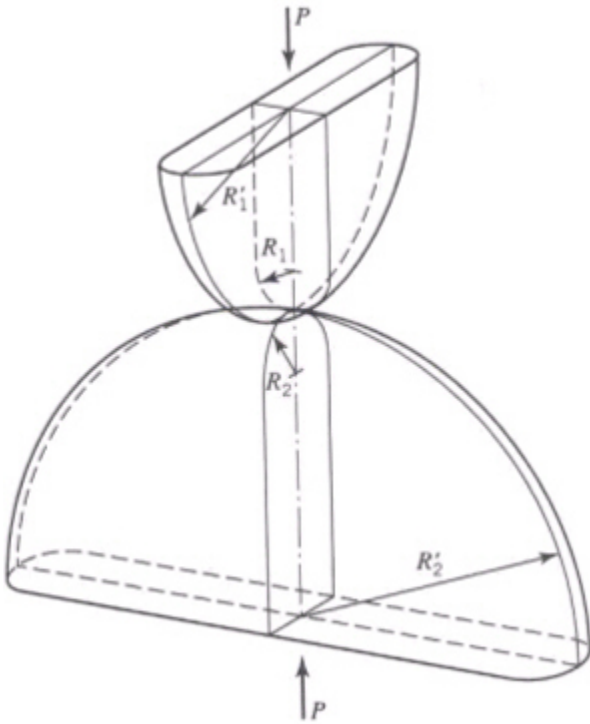

Figure taken from p. 590 of Boresi et al.

The intersection of the planes in which the radii R_1 and R_2 (or R_1' and R_2') lie form an angle aas shown in the figure below. Assume that there is no tendency for one disk to slide with respect to the other and, therefore, no friction force is present. Both disks are made of steel ($E_1=E_2$=200 GPa and $n_1=n_2$ _=0.29). The radii of curvature are _R_1=60mm, R_1'=130mm, R_2=80mm, R_2'=200mm. The angle a=0° and the applied force P=4.5kN. The maximum principal stress and approach (total distance through which the two disks move towards each other as a result of force P) are to be determined using ANSYS. This problem is a modified version of the problem presented in section 17.7, p. 607-608 of Boresi et al.
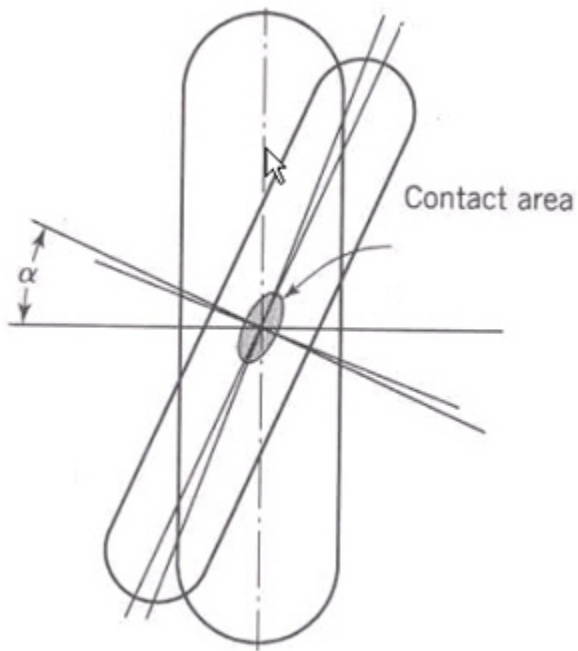
Contact area

Figure taken from p. 591 of Boresi et al.