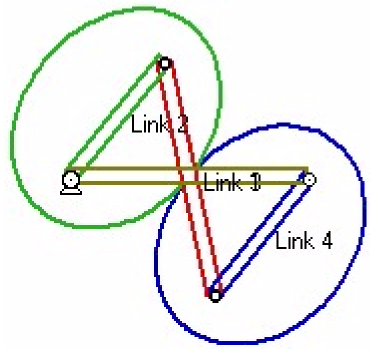


Because of the symmetrical butterfly configuration,

$I_{24}I_{23} = I_{24}I_{14}$

Hence,

$I_{12}I_{24}+I_{24}I_{23} = I_{12}I_{24}+I_{24}I_{14} = L_1$

This equation states that the sum of the distances from $I_{24}$ to the pivots $I_{12}$ and $I_{23}$ is constant. Therefore we can see that the locus of $I_{24}$ is an ellipse with foci at $I_{12}$ and $I_{13}$.

To an observer fixed on link 2 ($I_{12}I_{23}$), the locus of $I_{24}$ will be an ellipse with foci $I_{23}$ and $I_{12}$. To an observer fixed on link 4 ($I_{14}I_{34}$), the locus of $I_{24}$ will be an ellipse with foci $I_{34}$ and $I_{14}$. In other words, the centrode of link 4 is an ellipse congruent with that of link 2. If teeth are cut into the ellipses in order to avoid slippage at the contact point, we have the case of elliptical gears.

For information on ellipse geometry, click here.