What is claimed is:

1. A robot arm comprising:

a first link and a second link positioned adjacent to one another along a longitudinal axis of the robot arm;

a joint formed by the first and second links comprising a first convex contact portion of the first link and a second convex contact portion of the second link, the first and second convex contact portions configured to be in rolling contact with one another to allow the first and second links to pivot with respect to one another;

wherein the first and second convex contact portions are configured to contact one another at first and second contact points at the first and second convex contact portions corresponding to a first orientation of the first and second links;

wherein the first and second convex contact portions are configured to contact one another at third and fourth contact points at the first and second convex contact portions corresponding to a second orientation of the first and second links, wherein the second orientation is different from the first orientation;

wherein the joint is configured such that a line of action of a net force acting on the joint is incident with a first reference line extending between the first and second contact points when the first and second links are in the first orientation, and the line of action of the net force acting on the joint is incident with a second reference line extending between the third and fourth contact points when the first and second links are in the second orientation; and

wherein each of the first and second links comprise a plurality of through openings extending between proximal and distal ends thereof, wherein at least one of the plurality of through openings comprises proximal and distal portions that are enlarged relative to an intermediate portion of the through opening that extends between the proximal and distal portions.

2. The robot arm of claim 1, wherein the first and second convex contact portions each comprise a plurality of convex contact surfaces, wherein at least one of the plurality of convex contact surfaces is noncontiguous with another one of the plurality of convex contact surfaces.

3. The robot arm of claim 1, wherein the first and second convex contact portions each comprise a plurality of convex contact surfaces, wherein the plurality of convex contact

surfaces of each link extend along a cylindrical contour so as to allow movement of the first and second links with respect to one another with only a single degree of freedom.

4. The robot arm of claim 1, wherein the second link comprises a third convex contact portion opposite the second convex contact portion that is configured to be in rolling contact with a fourth convex contact portion of a third link positioned distally along the longitudinal axis from the second link, wherein the third convex contact portion is rotated at least 30 degrees about the longitudinal axis to allow the third link to be pivoted in a direction different than a direction the second link is pivoted relative to the first link.

5. The robot arm of claim 1, wherein the proximal portion of the at least one through opening is enlarged along a first direction transverse to the longitudinal axis, and the distal portion of the at least one through opening is enlarged along a second direction transverse to the longitudinal axis that is different from the first direction.

6. The robot arm of claim 1, wherein the proximal portion of the at least one through opening widens progressively along a proximal direction and the distal portion of the at least one through opening widens progressively along a distal direction.

7. The robot arm of claim 1, further comprising gear teeth of the first link and corresponding gear teeth of the second link that are configured to engage with one another and inhibit sliding of the first and second convex contact portions with respect to one another when the first and second links are shifted between the first and second orientations, wherein the gear teeth of each of the first and second links are disposed along an outer periphery of the first and second links.

8. The robot arm of claim 1, further comprising first and second through openings extending through each of the first and second links;

a first tension member extending through the first through opening of the first link and at least partially through the first through opening of the second link;

a second tension member extending through the second through opening of the first link and at least partially through the second through opening of the second link;

wherein the first and second tension members are fixed relative to the second link to allow the second link to be pivoted relative to the first link by pulling in one of the first and

second tension members proximally and paying out an other of the first and second tension members; and

wherein a length of the one of the first and second tension members that is pulled in is equal to a length of the other of the first and second tension members that is payed out.

9. The robot arm of claim 8, further comprising a third tension member extending at least partially through a third link that is distally adjacent to the second link, wherein the third tension member is fixed relative to the third link for shifting an orientation of the third link relative to the second link.

10. The robot arm of claim 8, wherein the first and second tension members each have a free length that spans the joint between the first and second links;

wherein the first reference line extending between the first and second contact points when the first and second links are in the first orientation is equidistant from each of the free lengths of the first and second tension members, and the second reference line extending between the third and fourth contact points when the first and second links are in the second orientation is also equidistant from each of the free lengths of the first and second tension members.

11. A robot arm comprising:

a first link and a second link positioned adjacent to one another along a longitudinal axis of the robot arm;

a joint formed between the first and second links comprising a first convex contact portion of the first link and a second convex contact portion of the second link, the first and second convex contact portions configured to be in rolling contact with one another to allow the first and second links to pivot with respect to one another;

wherein the first and second convex contact portions are configured to contact one another at first and second contact points at the first and second convex contact portions corresponding to a first orientation of the first and second links;

wherein the first and second convex contact portions are configured to contact one another at third and fourth contact points at the first and second convex contact portions corresponding to a second orientation of the first and second links, wherein the second orientation is different from the first orientation;

a first tension member extending through the first link and at least a portion of the second link;

a second tension member extending through the first link and at least a portion of the second link;

wherein the first and second tension members are fixed relative to the second link to allow the second link to be pivoted relative to the first link by pulling in one of the first and second tension members proximally and paying out an other of the first and second tension members distally;

wherein the first and second tension members each have a free length that spans the joint between the first and second links;

wherein a first reference line extending between the first and second contact points when the first and second links are in the first orientation is equidistant from each of the free lengths of the first and second tension members, and a second reference line extending between the third and fourth contact points when the first and second links are in the second orientation is also equidistant from each of the free lengths of the first and second tension members; and

wherein each of the first and second links comprise a plurality of through openings extending between proximal and distal ends thereof, wherein at least one of the plurality of through openings comprises proximal and distal portions that are enlarged relative to an intermediate portion of the through opening that extends between the proximal and distal portions.

12. The robot arm of claim 11, wherein for each of the first and second orientations of the first and second links, a length of the one of the first and second tension members that is pulled in proximally is equal to a length of the other of the first and second tension members that is payed out distally.

13. The robot arm of claim 11, wherein the first and second convex contact portions each comprise a plurality of convex contact surfaces, wherein at least one of the plurality of convex contact surfaces is noncontiguous with the other of the plurality of convex contact surfaces.

14. The robot arm of claim 11, wherein the first and second convex contact portions each comprise a plurality of convex contact surfaces, wherein the plurality of convex contact

surfaces of each link extend along a cylindrical contour so as to allow movement of the first and second links with respect to one another with only a single degree of freedom.

15. The robot arm of claim 11, wherein the second link comprises a third convex contact portion opposite the second convex contact portion that is configured to be in rolling contact with a fourth convex contact portion of a third link positioned distally along the longitudinal axis from the second link, wherein the third convex contact portion is rotated at least 30 degrees about the longitudinal axis to allow the third link to be pivoted in a direction different than a direction the second link is pivoted relative to the first link.

16. The robot arm of claim 11, wherein the proximal portion of the at least one through opening is enlarged along a first direction transverse to the longitudinal axis, and the distal portion of the at least one through opening is enlarged along a second direction transverse to the longitudinal axis that is different from the first direction.

17. The robot arm of claim 11, wherein the proximal portion of the at least one through opening widens progressively along a proximal direction and the distal portion of the at least one through opening widens progressively along a distal direction.

18. The robot arm of claim 11, further comprising a third tension member extending at least partially through a third link that is distally adjacent to the second link, wherein the third tension member is fixed relative to the third link for shifting an orientation of the third link relative to the second link.