What is claimed is:

1. A small footprint high bending stiffness connector for use with a plurality of piezoelectric active elements to form a multi-level axial displacement piezoelectric actuator of large overall axial displacements and blocking forces, said connector comprising:

a substantially solid cylindrical component having a first base, and a second base in an opposed, substantially parallel relationship to said first base;

a set of multiple connector recesses equally spaced and arranged circumferentially extending substantially through the connector from said first base, perpendicular to said first base; and

a set of multiple connector recesses equally spaced and arranged circumferentially extending substantially through the connector from said second base, perpendicular to said second base, which intersperse with the set of recess housings extending from the first base at approximately equal angular separation along the circumference of the connector;

wherein each connector recess can house a piezoelectric active element;

wherein the cross-section of each connector recess is substantially equal to that of the piezoelectric active element that it houses;

wherein the base of each connector recess is firmly connected to the connector body to avoid cantilever loading during use;

wherein the depth of each connector recess is preferably slightly shorter than the length of the piezoelectric active element that it houses; and

wherein the piezoelectric active elements housed in both sets of connector recesses operate in unison to produce an overall axial displacement approximately twice (2x) that of respective piezoelectric active elements and of blocking force comparable to or larger than that of respective piezoelectric active elements.

2. The connector as claimed in claim 1, wherein a cross-section of said connector comprises one of a circular shape, a square shape, a rectangular shape, a polygonal shape, a ring shape, or a polygonal ring shape.

3. The connector as claimed in any one of the preceding claims, wherein a cross-sectional shape for said connector recess comprises one of a circular cross-sectional

shape, a triangular cross-sectional shape, a square cross-sectional shape, a rectangular cross-sectional shape, a polygonal cross-sectional shape, a V-channel cross-sectional shape, a T-channel cross-sectional shape, or an L-channel cross-sectional shape.

4. The connector of claim 3, wherein said cross-sectional shape for said connector recess is approximately the same as a cross-sectional shape of a housed piezoelectric active element and said channel cross-sectional shape for said connector recess is approximately the same as the combined cross-sectional shape of two or more housed piezoelectric active elements.

5. The connector as claimed in any one of the preceding claims, wherein said bases are unitary with said connector.

6. The connector as claimed in any one of the claims 1-4, wherein said bases are mechanically fastened and/or bonded to said cylindrical component.

7. The connector as claimed in any one of the preceding claims, wherein said piezoelectric active element comprises one of a longitudinal (d_{33}) mode active element, a transverse (d_{31}) mode active element, or a transverse (d_{32}) mode active element.

8. The connector as claimed in any one of the preceding claims, wherein said piezoelectric active element comprises one of a piezo ceramic, an individual or a bonded assemblage of piezoelectric single crystal.

9. The connector as claimed in any one of the preceding claims, wherein said piezoelectric active element comprises a lead zirconate titanate [$PbZrO_3$-$PbTiO_3$] piezo-ceramic and/or high piezoelectricity lead-based relaxor solid solution single crystal compound selected from the group consisting of: lead zinc niobate-lead titanate [$Pb(Zn_{1/3}Nb_{2/3})O_3$-$PbTiO_3$], lead magnesium niobate-lead titanate [$Pb(Mg_{1/3}Nb_{2/3})O_3$-$PbTiO_3$], lead magnesium niobate-lead zirconate-lead tinanate [$Pb(Mg_{1/3}Nb_{2/3})O_3$-$PbZrO_3$-$PbTiO_3$], and lead indium niobate-lead magnesium-niobate-lead titanate [$Pb(In_{1/2}Nb_{1/2})O_3$-$Pb(Mg_{1/3}Nb_{2/3})O_3$-$PbTiO_3$] including their compositionally-modified derivatives.

10. The connector as claimed in any one of the preceding claims, wherein at least one of said connector recesses for housing said piezoelectric active elements comprises a ring shape.

11. The connector of claim 11, wherein said connector recesses of said ring shape comprises an outer shell having a thickness in the range of 0.2 to 0.5 times the width of said connector recesses of said ring shape.

12. The connector as claimed in any one of the preceding claims, wherein said connector comprises at least one opening to aid handling during manufacture of actuators from said connector.

13. The connector as claimed in any one of the preceding claims further comprising at least one high-stiffness load pad bonded to a base inside at least one of said connector recess.

14. The connector as claimed in any one of the preceding claims further comprising at least one stiffening plate bonded onto one or both end faces of said connector.

15. The connector as claimed in any one of the preceding claims, wherein said connector further comprises a central connector hole passing through said connector.

16. The connector as claimed in any one of the preceding claims, wherein said connector comprises one of a high modulus material, a light metal, an engineering ceramic, or a fibre-reinforced polymer.

17. The connector as claimed in any one of the preceding claims, wherein said connector comprises one of an iron-alloy, a nickel-alloy, a copper-based alloy, and a WC-Co cermet.

18. An assemblage comprising at least one connector of claims 1 to 17, at least one upper piezoelectric active element and at least one lower piezoelectric active element wherein said at least one upper piezoelectric active element protrudes from said first base and said at least one lower piezoelectric active element protrudes from said second base.

19. The assemblage of claim 18, wherein said upper and lower piezoelectric active elements comprise a cross sectional shape of a solid triangle, a hollow triangle, a solid square, a hollow square, a rectangle, a solid circle, a ring, or a pseudo-ring of a polygonal form.

20. The assemblage of claim 18, wherein said upper and lower piezoelectric active elements comprise single crystals.

21. The assemblage of claim 18, wherein each of said upper and lower piezoelectric active elements comprises a plurality of bonded piezoelectric single crystals.

22. An actuator comprising at least one said assemblage of claims 18-21 and at least one piezoelectric active element.

23. The actuator of claim 22 further comprising at least one pedestal, a base plate, a pre-stress mechanism, and a casing.

24. The actuator of claim 23 further comprising an anti-twist mechanism.

25. The actuator as claimed in any one of the claims 22-24, wherein said assemblage comprises a plurality of longitudinal (d_{33}) mode stacked active elements of solid triangular cross-sections.

26. The actuator of claim 25, wherein said longitudinal (d_{33}) mode stacked active elements comprise at least one of a lead zirconate titanate piezo-ceramic or a compositionally-modified derivative of a lead zirconate titanate piezo-ceramic.

27. The actuator of claim 26, wherein said longitudinal (d_{33}) mode stacked active elements comprise a single crystal selected from the group consisting of: lead zinc niobate-lead titanate [$Pb(Zn_{1/3}Nb_{2/3})O_3$-$PbTiO_3$], lead magnesium niobate-lead titanate [$Pb(Mg_{1/3}Nb_{2/3})O_3$-$PbTiO_3$], lead magnesium niobate-lead zirconate-lead tinanate [$Pb(Mg_{1/3}Nb_{2/3})O_3$-$PbZrO_3$-$PbTiO_3$], and lead indium niobate-lead magnesium-niobate-lead titanate [$Pb(In_{1/2}Nb_{1/2})O_3$-$Pb(Mg_{1/3}Nb_{2/3})O_3$-$PbTiO_3$] including their compositionally-modified derivatives.

28. The actuator as claimed in any one of the claims 22-24, wherein said assemblage comprises a transverse (d_{31} or d_{32}) mode active element of a hollow triangular cross-section.

29. The actuator of claim 28, wherein said transverse (d_{31} or d_{32}) mode active element comprises a lead zirconate titanate piezo-ceramic or a compositionally modified derivative of lead zirconate titanate piezo-ceramic.

30. The actuator of claim 28, wherein the transverse (d_{31} or d_{32}) mode active elements comprise a single crystal selected from the group consisting of: lead zinc niobate-lead titanate [$Pb(Zn_{1/3}Nb_{2/3})O_3$-$PbTiO_3$], lead magnesium niobate-lead titanate [$Pb(Mg_{1/3}Nb_{2/3})O_3$-$PbTiO_3$], lead magnesium niobate-lead zirconate-lead tinanate [$Pb(Mg_{1/3}Nb_{2/3})O_3$-$PbZrO_3$-$PbTiO_3$], and lead indium niobate-lead magnesium-niobate-lead titanate [$Pb(In_{1/2}Nb_{1/2})O_3$-$Pb(Mg_{1/3}Nb_{2/3})O_3$-$PbTiO_3$] including their compositionally-modified derivatives.

31. An underwater projector comprising a motor section having at least one of said connector as claimed in any one of the preceding claims and/or at least one of said assemblages as claimed in any one of the preceding claims.

32. The underwater projectors of claim 31 further comprising at least one of a head mass, a tail mass, a pre-stress mechanism, and a casing.