Claims:

1. A tubular connector having an axis and comprising:

a pin having a nose, an external shoulder, and a conical portion between the external shoulder and the nose containing a set of external threads;

a box having a bore, a rim that engages the external shoulder and a set of internal threads in the bore that engage the external threads;

an internal shoulder in the bore that is engaged by an end of the nose when the rim of the box engages the external shoulder; and

an annular recess formed in the bore of the box on a side of the internal shoulder opposite the nose, the annular recess being sized to provide flexibility to the internal shoulder so as to allow the internal shoulder to deflect when engaged by the end of the nose.

2. The tubular connector of Claim 1, wherein the internal shoulder is conical, having an outer diameter spaced farther from an end of the box than an inner diameter.

3. The tubular connector of Claim 1, wherein the annular recess has an inwardly and downwardly facing conical surface and an inwardly and upwardly facing conical surface.

4. The tubular connector of Claim 1, wherein the conical surfaces of the annular recess are formed at different angles relative to the axis of the tubular connector.

5. The tubular connector of Claim 1, further comprising an annular groove formed at an intersection of an inner diameter of the internal shoulder and the bore.

6. The tubular connector of Claim 5, wherein the annular groove has a substantially circular profile in transverse cross-section.

7. The tubular connector of Claim 1, wherein the annular recess has a depth at least equal to a radial thickness of the nose.

8. The tubular connector of Claim 1, wherein an inner flange is defined by an axial distance between the annular recess and the internal shoulder, the inner flange depending from a side wall of the bore.

9. A tubular connector having an axis and comprising:

a pin having an upward extending nose, an upward-facing external shoulder, and a conical portion between the external shoulder and the nose containing a set of external threads;

a box having a bore, a rim that engages the external shoulder and a set of internal threads in the bore that engage the external threads;

an internal shoulder in the bore that is engaged by an upper end of the nose when the rim of the box engages the external shoulder; and

an annular recess formed in the bore of the box a selected distance above the internal shoulder to define an inner flange that deflects when the internal shoulder is engaged by the upper end of the nose.

10. The tubular connector of Claim 9, wherein the annular recess has an inwardly and upwardly facing conical surface that defines an upper surface of the inner flange.

11. The tubular connector of Claim 10, wherein:

the internal shoulder is conical and faces downwardly and outwardly; and

the inwardly and upwardly facing conical surface of the annular recess is at a same angle relative to the axis of the tubular connector as the internal shoulder.

12. The tubular connector of Claim 9, wherein the annular recess comprises:

a lower conical surface that defines an upper surface of the inner flange; and

an upper conical surface that is at a lesser angle relative to the axis of the tubular connector than the lower conical surface.

13. The tubular connector of Claim 9, wherein:

the inner flange has an inner diameter equal to an inner diameter of the bore immediately above the annular recess and smaller than an inner diameter of the bore immediately below the inner flange.

14. The tubular connector of Claim 9, wherein:

an inner diameter of the bore immediately above the annular recess is the same as an inner diameter of the bore immediately below the annular recess;

the annular recess has an axial extent from a junction of an upper side of the annular recess with the bore to a junction with a lower side of the annular recess with the bore; and

the inner flange has an axial extent from an upper to a lower side of the inner flange at an inner diameter of the inner flange that is less than the axial extent of the annular recess.

15. The tubular connector of Claim 9, wherein:

the inner flange has a base that joins a body of the box and depends downwardly and inwardly from the body of the box; and

the inner flange has a lesser axial thickness at the base than at a free end.

16. The tubular connector of Claim 9, wherein:

an annular groove is formed at a junction of the internal shoulder with the bore, the annular groove being circular in transverse cross section.

17. The tubular connector of Claim 9, wherein the annular recess has a depth at least equal to a radial thickness of the nose of the pin.

18. A tubular connector having an axis and comprising:

a pin having an upward extending nose, an upward facing external shoulder, and a conical portion between the external shoulder and the nose containing a set of external threads;

a box having a bore, a rim that engages the external shoulder and a set of internal threads in the bore that engage the external threads;

the bore having a bore nose portion with an inner diameter that receives the nose of the pin;

an internal shoulder at an upper end of the bore nose portion that is engaged by an upper end of the nose when the rim of the box engages the external shoulder;

the bore of the box having an upper portion extending upward from the internal shoulder that has a lesser inner diameter than an inner diameter of the bore nose portion;

an annular recess formed in the upper portion of the bore of the box a selected distance above the internal shoulder, the annular recess having a conical lower surface and a conical upper surface; and

the conical lower surface and the internal shoulder define upper and lower surfaces, respectively, of an inner flange that deflects when the internal shoulder is engaged by the upper end of the nose and the rim is in engagement with the external shoulder.

19. The tubular connector of Claim 18, wherein:

the internal shoulder is conical and tapers inwardly and downwardly.

20. The tubular connector of Claim 18, wherein the conical lower surface of the annular recess is at a greater angle relative to the axis than the conical upper surface of the annular recess.

21. The tubular connector of Claim 18, wherein an axial dimension of the annular recess measured at an inner diameter of the annular recess is greater than an axial dimension of inner flange measured at an inner diameter of the inner flange.

CLAIMS

1. A tubular connector having an axis and comprising:

a pin having a nose, an external shoulder, and a conical portion between the external shoulder and the nose containing a set of external threads;

a box having a bore, a rim that engages the external shoulder and a set of internal threads in the bore that engage the external threads;

an internal shoulder in the bore that is engaged by an end of the nose when the rim of the box engages the external shoulder; and

an annular recess formed in the bore of the box on a side of the internal shoulder opposite the nose to define an inner load bearing flange, the annular recess being sized to provide flexibility to the internal shoulder so as to allow the internal shoulder to deflect when engaged by the end of the nose; wherein

the inner flange has a minimum flange thickness, and a flange width measured from a base of the inner flange to an inner diameter surface of the inner flange, the flange thickness being greater than 40% of the flange width.

2. The tubular connector of claim 1, wherein the internal shoulder is conical, having an outer diameter spaced farther from an end of the box than an inner diameter.

3. The tubular connector of claim 1, wherein the annular recess has an inwardly and downwardly facing conical surface and an inwardly and upwardly facing conical surface.

4. The tubular connector of claim 1, wherein the conical surfaces of the annular recess are formed at different angles relative to the axis of the tubular connector.

5. The tubular connector of claim 1, further comprising an annular groove formed at an intersection of an inner diameter of the internal shoulder and the bore.

6. The tubular connector of claim 5, wherein the annular groove has a substantially circular profile in transverse cross-section.

7. The tubular connector of claim 1, wherein the annular recess has a depth at least equal to a radial thickness of the nose.

8. The tubular connector of claim 1, wherein the inner flange is defined by an axial distance between the annular recess and the internal shoulder, the inner flange depending from a side wall of the bore.

9. A tubular connector having an axis and comprising:

a pin having an upward extending nose, an upward-facing external shoulder, and a conical portion between the external shoulder and the nose containing a set of external threads;

a box having a bore, a rim that engages the external shoulder and a set of internal threads in the bore that engage the external threads;

an internal shoulder in the bore that is engaged by an upper end of the nose when the rim of the box engages the external shoulder; and

an annular recess formed in the bore of the box a selected distance above the internal shoulder to define an inner lead bearing flange the deflects when the internal shoulder is engaged by the upper end of the nose; wherein

the inner flange has a minimum flange thickness, and the flange width measured from a base of the inner flange to an inner diameter surface of the inner flange, the flange thickness being greater than 40% of the flange width.

10. The tubular connector of claim 9, wherein the annular recess has an inwardly and upwardly facing conical surface that defines an upper surface of the inner flange.

11. The tubular connector of claim 9, wherein:

the internal shoulder is conical and faces downwardly and outwardly; and

the inwardly and upwardly facing conical surface of the annular recess is at a same angle relative to the axis of the tubular connector as the internal shoulder.

12. The tubular connector of claim 9, wherein the annular recess comprises:

a lower conical surface that defines an upper surface of the inner flange; and

an upper conical surface that is at a lesser angle relative to the axis of the tubular connector than the lower conical surface.

13. The tubular connector of claim 9, wherein:

the inner flange has an inner diameter equal to an inner diameter of the bore immediately above the annular recess and smaller than an inner diameter of the bore immediately below the inner flange.

14. The tubular connector of claim 9, wherein:

an inner diameter of the bore immediately above the annular recess is the same as an inner diameter of the bore immediately below the annular recess;

the annular recess has an axial extent from a junction of an upper side of the annular recess with the bore to a junction with a lower side of the annular recess with the bore; and

the inner flange has an axial extent from an upper to a lower side of the inner flange at an inner diameter of the inner flange that is less than the axial extent of the annular recess.

15. The tubular connector of claim 9, wherein:

the inner flange has a base that joins a body of the box and depends downwardly and inwardly from the body of the box; and

the inner flange has a lesser axial thickness at the base than at a free end.

16. The tubular connector of claim 9, wherein:

an annular groove is formed at a junction of the internal shoulder with the bore, the annular groove being circular in transverse cross section.

17. The tubular connector of claim 9, wherein the annular recess has a depth at least equal to a radial thickness of the nose of the pin.

18. A tubular connector having an axis and comprising:

a pin having an upward extending nose, an upward facing external shoulder, and a conical portion between the external shoulder and the nose containing a set of external threads;

a box having a bore, a rim that engages the external shoulder and a set of internal threads in the bore that engage the external threads;

the bore having a bore nose portion with an inner diameter that receives the nose of the pin;

an internal shoulder at an upper end of the bore nose portion that is engaged by an upper end of the nose when the rim of the box engages the external shoulder;

the bore of the box having an upper portion extending upward from the internal shoulder that has a lesser inner diameter than an inner diameter of the bore nose portion;

an annular recess formed in the upper portion of the bore of the box a selected distance above the internal shoulder, the annular recess having a conical lower surface and a conical upper surface; and

the conical lower surface and the internal shoulder define upper and lower surfaces, respectively, of an inner flange that deflects when the internal shoulder is engaged by the upper end of the nose and the rim is in engagement with the external shoulder; wherein

the inner flange has a minimum flange thickness, and a flange width measured from a base of the inner flange to an inner diameter surface of the inner flange, the flange thickness being greater than 40% of the flange width.

19. The tubular connector of claim 18, wherein:

the internal shoulder is conical and tapers inwardly and downwardly.

20. The tubular connector of claim 18, wherein the conical lower surface of the annular recess is at a greater angle relative to the axis than the conical upper surface of the annular recess.

21. The tubular connector of claim 18, wherein an axial dimension of the annular recess measured at an inner diameter of the annular recess is greater than an axial dimension of inner flange measured at an inner diameter of the inner flange.