What is claimed is:

1. A tubular connector (18) comprising:

a first tubular member (41) having an axis (24) and an end portion (43) with grooves (47) formed on an outer diameter of the end portion (43);

a second tubular member (17) having an end portion (19) with a plurality of box end fingers (23) separated by slots (25) and grooves (31) formed on an inner surface of the box end fingers (23), the second tubular member (17) being coaxial with the first tubular member (41);

wherein the grooves (47) of the first tubular member (41) are proximate to the grooves (31) of the second tubular member (17) when the first tubular member (41) is inserted into the end (19) of the second tubular member (17) in an initial position;

an outer sleeve (35) disposed around the box end fingers (23) and having an inner surface (36); and

wherein axial movement of the outer sleeve (35) relative to the box end fingers (23) causes the inner surface (36) of the outer sleeve (35) to slide against an outer surface (33) of the box end fingers (35), causing the box end fingers (23) to contract radially into engagement with the grooves (47) on the end portion (43) of the second tubular member (41), thereby securing the first tubular member (17) to the second tubular member (41) in a made-up position.

2. The tubular connector (18) of Claim 1, wherein:

a depth of the second tubular member grooves (47) increases as the grooves (47) approach the second tubular member end; and

a depth of the first tubular member grooves 931) decreases as the grooves (31) approach the first tubular member end.

3. The tubular connector (18) of Claim 1, further comprising:

an unlocking ring (49) interposed between the first tubular member (17) and the outer sleeve (35);

wherein the unlocking ring (49) is secured to the outer sleeve (35) for movement therewith;

wherein the unlocking ring (49) has a protrusion (51) extending from a bottom of the unlocking ring (49);

wherein axial movement of the outer sleeve (35) in a first direction to move the box end fingers (23) from the initial to the made-up position moves the unlocking ring (49) in the first direction; and

wherein axial movement of the outer sleeve (35) in a second direction to move the box end fingers (23) from the made-up to the initial position moves the unlocking ring (49) in the second direction, interposing the protrusion (51) between the grooves (47, 31) of the first and second tubular members (41, 17) to separate the first and second tubular members (41, 17).

4. The tubular connector (18) of Claim 1, further comprising a seal (48) between the end portion (43) of the first tubular member (41) of the outer sleeve (35).

5. The tubular connector (18) of Claim 1, further comprising a seal (22) between the end portion (19) of the second tubular member (17) and the outer sleeve (35).

6. The tubular connector (18) of Claim 1, further comprising a nose seal (29) interposed between the end portion (43) of the first tubular member (41) and the end portion (19) of the second tubular member (17).

7. The tubular connector (18) of Claim 1, wherein the outer surface (33) of the box end fingers (23) is arcuate.

8. The tubular connector (18) of Claim 1, wherein the inner surface (36) of the outer sleeve (35) is tapered.

9. The tubular connector (18) of Claim 8, wherein the outer sleeve (35) has a cylindrical inner surface that extends from the tapered surface (36) in a direction away from the end portion (43) of the first tubular member (41).

10. A method for joining tubular members (41, 17) comprising the steps of:

(a) providing a first tubular member (41) having a pin end (43);

(b) providing a second tubular member (17) having a box end (19) with outwardly biased fingers (23) and an axially moveable sleeve (35) having an inner cam surface (36);

(c) inserting the pin end (43) of the first tubular member (41) into the box end (19) of the second tubular member (17) to bring oppositely facing grooves (31, 47) on the box end (19) and the pin end (43) proximate to each other in an initial position; and

(d) moving the sleeve (35) on an outer surface (33) of the box end (19) axially toward the first tubular member (41) to move the box end fingers (23) of the box end (19) of the second tubular member (17) inward into engagement with the pin end (43) of the first tubular member (41) to fully engage the opposite facing grooves (47, 31) and secure the first tubular member (41) to the second tubular member (17).

11. The method of Claim 10, wherein step (c) further comprises placing a nose seal (29) on an upward facing shoulder (27) of the second tubular member (17) so that the nose seal (29) seals to the first tubular member (17) and the second tubular member (41) after the first tubular member (17) is inserted into the second tubular member (41) and the box end fingers (23) engage the pin end (43) in a made-up position.

12. The method of Claim 10, further comprising:

providing an unlocking ring (49) interposed between the first tubular member (17) and the outer sleeve (35) and a first end residing within an inner diameter groove (55) of the outer sleeve (35); and

moving the outer sleeve (35) axially in a direction to move the box end fingers (23) from the made-up to the initial position to move the unlocking ring (49) axially downwards, interposing a protrusion (51) between the grooves (47, 31) of the first and second tubular members (41, 17) to separate the first and second tubular members (41, 17).

CLAIMS

1. A tubular connector comprising:

a first tubular member having an axis and an end portion with grooves formed on an outer diameter of the end portion;

a second tubular member having an end portion with a plurality of box end fingers separated by slots and grooves formed on an inner surface of the box end fingers, the second tubular member being coaxial with the first tubular member;

a convex outer surface on an outer side of each of the fingers;

wherein the grooves of the first tubular member are proximate to the grooves of the second tubular member when the first tubular member is inserted into the end of the second tubular member in an initial position;

an outer sleeve disposed around the box end fingers and having an inner surface with an annular recess engaged by the convex arcuate surfaces of the fingers;

an unlocking ring interposed between the first tubular member and the outer sleeve; and

wherein axial movement of the outer sleeve relative to the box end fingers causes the recess in the inner surface of the outer sleeve to slide against the convex outer surface of the box end fingers, causing the box end fingers to contract radially into engagement with the grooves on the end portion of the second tubular member, such that the outer sleeve seals against the first tubular member, thereby securing the first tubular member to the second tubular member in a made-up position.

2. The tubular connector of claim 1, wherein:

a depth of the second tubular member grooves gradually increases as the grooves approach the second tubular member end; and

a depth of the first tabular member grooves gradually decreases as the grooves approach the first tubular member end.

3. The tabular connector of claim 1,

wherein the box end fingers join each other at a cylindrical base of the end portion of the first tubular member;

the box end fingers have a lesser wall thickness area axially between the base and the grooves on the box end fingers to increase flexibility of the box end fingers.

4. The tubular connector of claim 1, further comprising:

a first seal between the end portion of the first tubular member and the outer sleeve:

a second seal between the end portion of the second tubular member and the outer sleeve; and

wherein the grooves of the first tubular member, the grooves of the second tubular member, the convex outer surface and the annular recess are located axially between the first and the second seals.

5. The tubular connector of claim 1, wherein the recess has an axial dimension in excess of an axial dimension of the convex outer surfaces on the fingers.

6. The tabular connector of claim 1, further comprising a nose seal interposed between a nose of the end portion of the first tubular member and an internal shoulder in the end portion of the second tubular member.

7. The tubular connector of claim 1, wherein the convex outer surface of the box end fingers is arcuate and has a radius of curvature with a center point located inward of the convex outer surface.

8. The tubular connector of claim 1, wherein the recess in the inner surface of the outer sleeve is has a conical portion joining a cylindrical portion.

9. The tubular connector of claim 1, wherein the sleeve has a wall thickness that is thinner in an area containing the recess than in portion of the sleeve joining the recess.

10. A tubular connector comprising:

a first tubular member having an axis and an end portion with grooves formed on an outer diameter of the end portion;

a second tubular member having an end portion with a plurality of outwardly biased box end fingers separated by slots, grooves formed on an inner surface of the box end fingers, and an arcuate surface on an outer surface of the box end fingers, the second tubular member being coaxial with the first tubular member;

the arcuate surface having first and second edges axially spaced apart, and a radius of curvature extending between the first and second edges, the radius of curvature having a center point inward from the arcuate surface;

a depth of the second tubular member grooves increases as the grooves approach the second tubular member end portion;

a depth of the first tubular member grooves decreases as the grooves approach the first tubular member end portion;

wherein the grooves of the first tubular member are proximate to the grooves of the second tubular member when the first tubular member is inserted into the end of the second tubular member in an initial position;

an outer sleeve disposed around the box end fingers and having a cylindrical inner surface and an annular inner recess joining the cylindrical inner surface and tapering outwardly from the cylindrical inner surface;

an unlocking ring interposed between the first tubular member and the outer sleeve; and

wherein axial movement of the outer sleeve relative to the box end fingers causes the inner recess of the outer sleeve to slide against the arcuate surface of the box end fingers, causing the box end fingers to contract radially into engagement with the grooves on the end portion of the second tubular member, thereby securing the first tubular member to the second tubular member in a made-up position.

11. The tubular connector of claim 10, further comprising:

the unlocking ring having a first end residing within an inner diameter groove of the outer sleeve;

wherein the unlocking ring has a protrusion extending from a bottom of the unlocking ring on a second end opposite the first end;

axial movement of the outer sleeve in a first direction to move the box end fingers from the initial to the made-up position moves the unlocking ring axially upwards; and

axial movement of the outer sleeve in a second direction to move the box end fingers from the made-up to the initial position moves the unlocking ring axially downwards, interposing the protrusion between the grooves of the first and second tubular members to separate the first and second tubular members.

12. The tubular connector of claim 10, further comprising:

a first seal between the end portion of the first tubular member and the outer sleeve and

a second seal between the end portion of the second tubular member and the outer sleeve; and wherein

the box end fingers are located axially between the first and the second seals.

13. The tubular connector of claim 10, wherein the sleeve has a wall thickness that is thinner in an area containing the inner recess than in portions of the sleeve joining the inner recess.

14. The tubular connector of claim 10, wherein an outer recess is formed in the outer surface of the box end fingers that separates the arcuate outer surface from a cylindrical outer surface of the end portion of the second tubular member.

15. A method for joining tubular members comprising the steps of:

(a) providing a first tubular member having a pin end with grooves on an external surface thereof;

(b) providing a second tubular member having a box end with outwardly biased fingers, with free ends having grooves on internal surfaces thereof, the free ends having convex outer surfaces;

(c) providing a sleeve axially movable between an unlocked and a locked position, the sleeve having an inner surface with a tapered annular recess formed therein and in engagement with the outer surfaces of the box end fingers;

wherein in the locked position the sleeve is moved away from the first tubular member so that the recess of the sleeve allows the box end of the second tubular member to expand outwardly until the grooves on the box end fingers separate from the grooves on the pin end; and

wherein in the locked position the sleeve is moved toward the first tubular member so that the recess of the sleeve interacts with the convex outer surfaces of the box end fingers to move the grooves of the box end fingers into engagement with the grooves of the pin end;

(d) inserting the pin end of the first member into the box end of the second tubular member;

(e) moving the sleeve for the unlocked to the locked position; and

(f) providing an unlocking ring interposed between the first tubular member and the outer sleeve, the unlocking ring having a protrusion positioned for interposition between the pin end of the first tubular member and the box end fingers of the second tubular member.

16. The method of claim 15, wherein step (c) further comprises placing a nose seal on an internal shoulder of the second tubular member so that the nose seal seals to a nose on the first tubular member after the first tubular member is inserted into the second tubular member and the box end fingers engage the pin end in a made-up position.

17. A tubular connector comprising:

a first tubular member having an axis and an end portion with grooves formed on an outer diameter of the end portion, and a nose section extending past the grooves;

a second tubular member having an end portion with a plurality of box end fingers separated by slots and joined together at a base of the second tubular member, the box end fingers having free ends opposite the base with grooves formed on an inner surface of the box end fingers, the box end fingers having an outward rounded outer surface located outward from the grooves on the box end fingers, the box end fingers having a conical recess extending between the base and the outward rounded outer surface, the second tubular member being coaxial with the first tubular member;

wherein the grooves of the first tubular member are proximate to the grooves of the second tubular member when the first tubular member is inserted into the end of the second tubular member in an initial position;

an outer sleeve disposed around the box end fingers and having a cylindrical inner surface that joins an inner recess that tapers outwardly form the cylindrical inner surface;

an unlocking ring interposed between the first tubular member and the outer sleeve; and

wherein axial movement of the outer sleeve relative to the box end fingers causes the inner recess of the outer sleeve to slide against the rounded outer surface of the box end fingers, causing the box end fingers to contract radially into engagement with the threads on the end portion of the second tubular member, thereby securing the first tubular member to the second tubular member in a made-up position.

18. The tubular connector of claim 17, wherein:

a depth of the second tubular member grooves increases in a direction toward the free ends of the box end fingers; and

a depth of the first tubular member grooves decreases in a direction toward the nose section of the first tubular member.

19. The tubular connector of claim 17, further comprising:

the unlocking ring being secured to the outer sleeve for movement therewith;

wherein the unlocking ring has a protrusion extending from a bottom of the unlocking ring;

wherein axial movement of the outer sleeve in a first direction to move the box end fingers from the initial to the made-up position moves the unlocking ring in the first direction; and

wherein axial movement of the outer sleeve in a second direction to move the box end fingers from the made-up to the initial position moves the unlocking ring in the second direction, interposing the protrusion between the grooves of the first and second tubular members to separate the first and second tubular members.

20. The tubular connector of claim 17, further comprising:

it first seal between the end portion of the first tubular member of the outer sleeve;

a second seal between the base of the second tubular member and the outer sleeve; and

wherein the box end fingers are positioned axially between the first and second seals.

21. The tubular connector of claim 20, further comprising:

a cylindrical seal surface located within the outer sleeve and joining the inner recess on an edge opposite the cylindrical inner surface of the outer sleeve; and

a seal on the first tubular member that engages the cylindrical seal surface.

22. The tubular connector of claim 17, further comprising a nose seal interposed between the nose section of the first tubular member and an internal shoulder in the end portion of the second tubular member.