CLAIMS

WHAT IS CLAIMED IS:

1. A seal assembly, comprising:

an outer member having a bore;

an inner member adapted to be located in the bore;

a seal housing located between the inner and outer members, wherein the seal housing is received, a pocket formed on the outer member;

a cylindrical groove formed on an inner surface of the seal housing;

a segmented tube having an outward facing protrusion corresponding to the cylindrical groove when installed within the seal housing, wherein a plurality of segments comprising the tube have edges cut at an angle to allow installation within the seal housing; and

a bushing for lockingly engaging an inner profile of the segmented tube, wherein the bushing is located between the inner member and the segmented tube when installed.

2. The seal assembly of claim1, further comprising a lower inner seal located within a seal recess formed in the seal housing adjacent to the inner member and below the segmented tube.

3. The seal assembly of claim 2, wherein a portion of the segmented tube extends radially inward over the lower inner seal to maintain it within the seal recess.

4. The seal assembly of claim1, further comprising an upper inner seal located adjacent the inner member and supported by an upward facing shoulder formed by an upper surface of the bushing and an upper surface of the segmented tube.

5. The seal assembly of claim 1, wherein segments comprising the segmented tube that are adjacent to each other have surfaces cut at an angle in an alternating inward and outward sequence to allow adjacent segments to align and mate at the surfaces when installed within the cylindrical groove, the angle of the cut being in a range from between about 10 degrees to about 70 degrees.

6. The seal assembly of claim 1, wherein the bushing has a locking mechanism comprising one of the following:

a.) an outward facing threaded profile for threadingly engaging a corresponding inward facing profile on the segmented tube; or

b.) an outward facing profile for slidingly engaging a corresponding inward facing profile on the segmented tube.

7. The seal assembly of claim 1, wherein the segmented tube has an L-shaped outer profile for engaging the seal housing.

8. The seal assembly of claim 1, wherein a set screw traverses a passage on the bushing and the segmented tube to prevent unlocking of the bushing and the segmented tube.

9. The seal assembly of claim 1, wherein the outer member is a valve bonnet and the inner member is a valve stem.

10. The seal assembly of claim 1, wherein the outer member is a wellhead housing and the inner member is a casing hanger.

11. A seal locking assembly, comprising:

a seal housing located between inner and outer members, wherein the seal housing is received within a pocket formed on the outer member;

a cylindrical recess formed on an inner surface of the seal housing;

a segmented tube having an outward facing protrusion corresponding to the cylindrical groove when installed within the seal housing, wherein a plurality of segments comprising the tube have edges cut at an angle to allow installation within the seal housing; and

a locking ring for lockingly engaging an inner profile of the segmented tube, wherein the bushing is located between the inner member and the segmented tube when installed.

12. The seal locking assembly of claim 11, further comprising:

a lower inner seal located within a seal recess formed in the seal housing adjacent to the inner member and below the segmented tube, wherein a portion of the segmented tube extends radially inward over the lower inner seal to maintain the lower inner seal within the seal recess;

an upper inner seal located adjacent the inner member and supported by an upward facing shoulder formed by an upper surface of the locking ring and an upper surface of the segmented tube, wherein the lower and upper inner seals are the same size.

13. The seal locking assembly of claim 12, wherein the lower and upper inner seals are separated by the seal locking assembly, the seal locking assembly decoupling forces on the lower and upper inner seals.

14. The seal assembly of claim 11, wherein segments comprising the segmented tube that are adjacent to each other have surfaces cut at an angle in an alternating inward and outward sequence to allow adjacent segments to align and mate at the surfaces when installed within the cylindrical groove, the angle of the cut being in a range from between about 10 degrees to about 70 degrees.

15. The seal assembly of claim 11, wherein the bushing has a locking mechanism comprising one of the following:

a.) an outward facing threaded profile for threadingly engaging a corresponding inward facing profile on the segmented tube; or

b.) an outward facing profile for slidingly engaging a corresponding inward facing profile on the segmented tube.

16. The seal assembly of claim 11, wherein the segmented tube has an L-shaped outer profile for engaging the seal housing.

17. The seal assembly of claim 11, wherein a set screw traverses a passage on the bushing and the segmented tube to prevent unlocking of the bushing and the segmented tube.

18. The seal assembly of claim 1, wherein the outer member is a valve bonnet and the inner member is a valve stem.

19. The seal assembly of claim 1, wherein the outer member is a wellhead housing and the inner member is a casing hanger.

20. A method for locking a seal assembly, comprising:

providing a seal housing located between inner and outer members, a cylindrical recess formed on an inner surface of the seal housing, a segmented tube having an outward facing protrusion corresponding to the cylindrical groove, wherein a plurality of segments comprising the tube have edges cut at an angle in alternating inward and outward sequence to allow installation within the seal housing; and a locking ring for lockingly engaging an inner profile of the segmented tube, wherein the locking ring is located between the inner member and the segmented tub;

landing the seal housing in outer member;

landing a lower inner seal within a seal recess formed in the seal housing;

installing the segments that comprise the segmented tube within the seal housing, wherein the outward facing protrusion of the segments mates with corresponding cylindrical groove in the seal housing;

engaging the locking ring into locking engagement with the segments comprising the segmented tube to lock the sealing assembly in place; and

landing an upper inner seal on an upward facing shoulder formed by upper surface of the locking ring and upper surface of the seal housing.

CLAIMS

1. A seal assembly, comprising:

an outer member having a bore;

an inner member adapted to be located in the bore;

a seal housing located between the inner and outer members, wherein the seal housing is received within a pocket formed on the outer member;

a cylindrical groove formed on an inner surface of the seal housing;

a segmented tube having an outward facing protrusion corresponding to the cylindrical groove when installed within the seal housing, wherein a plurality of segments comprising the segmented tube have edges cut at an angle such that the plurality of segments comprising the segmented tube that are adjacent to each other have surfaces cut in an alternating inward and outward sequence to allow adjacent segments of the plurality of segments to align and mate at the surfaces when installed within the cylindrical groove and to allow installation within the seal housing; and

a bushing for lockingly engaging an inner profile of the segmented tube, wherein the bushing is located between the inner member and the segmented tube when installed.

2. The seal assembly of claim 1, further comprising a lower inner seal located within a seal recess formed in the seal housing adjacent to the inner member and below the segmented tube.

3. The seal assembly of claim 2, wherein a portion of the segmented tube extends radially inward over the lower inner seal to maintain the lower inner seal within the seal recess.

4. The seal assembly of claim 1, further comprising an upper inner seal located adjacent the inner member and supported by an upward facing shoulder formed by an upper surface of the bushing and an upper surface of the segmented tube.

5. The seal assembly of claim 1, wherein the angle of the cut is in a range from between about 10 degrees to about 70 degrees.

6. The seal assembly of claim 1, wherein the bushing has a locking mechanism comprising one of the following:

a.) an outward facing threaded profile for threadingly engaging a corresponding inward facing profile on the segmented tube; or

b.) an outward facing profile for slidingly engaging a corresponding inward facing profile on the segmented tube.

7. The seal assembly of claim 1, wherein the segmented tube has an L-shaped outer profile for engaging the seal housing.

8. The seal assembly of claim 1, wherein a set screw traverses a passage on the bushing and the segmented tube to prevent unlocking of the bushing and the segmented tube.

9. The seal assembly of claim 1, wherein the outer member is a valve bonnet and the inner member is a valve stem.

10. The seal assembly of claim 1, wherein the outer member is a wellhead housing and the inner member is a casing hanger.

11. The seal assembly of claim 1, wherein the outer member is a valve bonnet and the inner member is a valve stem.

12. The seal assembly of claim 1, wherein the outer member is a wellhead housing and the inner member is a casing hanger.

13. A seal locking assembly, comprising:

a seal housing located between inner and outer members, wherein the seal housing is received within a pocket formed on the outer member;

a cylindrical recess formed on an inner surface of the seal housing;

a segmented tube having an outward facing protrusion corresponding to the cylindrical groove when installed within the seal housing, wherein a plurality of segments comprising the tube have edges cut at an angle such that the plurality of segments comprising the segmented tube that are adjacent to each other have surfaces cut in an alternating inward and outward sequence to allow adjacent segments of the plurality of segments to align and mate at the surfaces when installed within the cylindrical groove and to allow installation within the seal housing; and

a bushing for lockingly engaging an inner profile of the segmented tube, wherein the bushing is located between the inner member and the segmented tube when installed.

14. The seal locking assembly of claim 13, further comprising:

a lower inner seal located within a seal recess formed in the seal housing adjacent to the inner member and below the segmented tube, wherein a portion of the

segmented tube extends radially inward over the lower inner seal to maintain the lower inner seal within the seal recess;

an upper inner seal located adjacent the inner member and supported by an upward facing shoulder formed by an upper surface of the bushing and an upper surface of the segmented tube, wherein the lower and upper inner seals are the same size.

15. The seal locking assembly of claim 14, wherein the lower and upper inner seals are separated by the seal locking assembly, the seal locking assembly decoupling forces on the lower and upper inner seals.

16. The seal assembly of claim 13, wherein the angle of the cut is in a range from between about 10 degrees to about 70 degrees.

17. The seal assembly of claim 13, wherein the bushing has a locking mechanism comprising one of the following:

a.) an outward facing threaded profile for threadingly engaging a corresponding inward facing profile on the segmented tube; or

b.) an outward facing profile for slidingly engaging a corresponding inward facing profile on the segmented tube.

18. The seal assembly of claim 13, wherein the segmented tube has an L-shaped outer profile for engaging the seal housing.

19. The seal assembly of claim 13, wherein a set screw traverses a passage on the bushing and the segmented tube to prevent unlocking of the bushing and the segmented tube.

20. A method for locking a seal assembly, comprising;

providing a seal housing located between inner and outer members, a cylindrical recess formed on an inner surface of the seal housing, a segmented tube having an outward facing protrusion corresponding to the cylindrical groove, wherein a plurality of segments comprising the tube have edges cut at an angle in alternating inward and outward sequence to allow installation within the seal housing; and a locking ring for lockingly engaging an inner profile of the segmented tube, wherein the locking ring is located between the inner member and the segmented tub;

landing the seal housing in outer member;

landing a lower inner seal within a seal recess formed in the seal housing;

installing the segments that comprise the segmented tube within the seal housing, wherein the outward facing protrusion of the segments mates with corresponding cylindrical groove in the seal housing;

engaging the locking ring into locking engagement with the segments comprising the segmented tube to lock the sealing assembly in place; and

landing an upper inner seal on an upward facing shoulder formed by upper surface of the locking ring and upper surface of the seal housing.