Seal With Lip Projections

[0001]

Field of the Invention

[0002] This invention relates to seals for mechanical couplings and fittings for joining pipe elements.

Background

[0003] Mechanical couplings and fittings (such as elbow and Tee fittings) for joining pipe elements employ flexible, resilient seals to form fluid-tight joints, capable of withstanding service pressures for a particular application. In operation, a seal is positioned between the segments or housing portions which are bolted together to respectively form the coupling or fitting. The seal has circumferential sealing surfaces that engage the outer surfaces of the pipe elements when the pipe elements are inserted into or otherwise engaged with the coupling or fitting. Upon proper tightening of the bolts the seal is compressed between the coupling segments or the housing portions and the pipe elements, the segments or housing portions engage and mechanically restrain the pipe elements, and a fluid-tight joint, capable of withstanding the required design service pressure, is formed.

[0004] However, in a piping network having tens or hundreds of mechanical couplings and fittings it is possible that one or more couplings or fittings might be improperly installed. The most common problem is the bolts not being tightened or

not sufficiently tightened. Such a coupling or fitting might not be fluid tight under service pressure, but, because the seal has sealing surfaces that engage the pipe elements before tightening of the bolts, such improperly installed couplings or fittings might tend to maintain a fluid-tight seal under the relatively lower test pressure used to check the integrity of the piping network and thus might give a false indication of proper installation. Because the improperly installed couplings do not leak under test pressure they might not be found until full service pressure is applied to the network. It is desirable to avoid this situation, and thus it is advantageous to have seals that intentionally leak if the coupling or fitting of which they are a part is improperly installed.

Summary

[0004a] According to a first aspect of the present invention, there is provided a seal, comprising: a first ring having a first peripheral wall extending circumferentially therearound; a first lobe attached to said first peripheral wall, said first lobe extending circumferentially around said first ring; a first sealing surface positioned on said first lobe, said first sealing surface extending circumferentially around said first ring; at least a first projection extending from said first sealing surface, said first projection defining a closeable leak path across said first sealing surface; a second ring having a second peripheral wall extending circumferentially around said second ring; a second lobe attached to said second peripheral wall, said second lobe extending circumferentially around said second ring; a second sealing surface positioned on said second lobe, said second sealing surface extending circumferentially around said second ring; and a tube connecting said first and second rings to one another.

[0004b] According to a second aspect of the present invention, there is provided a fitting for connecting at least two pipe elements together, said fitting comprising: first and second housing portions attached to one another and defining at least first and second receptacles for receiving said pipe elements, said housing portions further defining a fluid path extending between said first and second receptacles; a seal positioned between said first and second housing portions, said seal comprising: a first ring having a first peripheral wall extending circumferentially

therearound, said first ring being received within said first receptacle; a first lobe attached to said first peripheral wall, said first lobe extending circumferentially around said first ring; a first sealing surface positioned on said first lobe, said first sealing surface extending circumferentially around said first ring; at least a first projection extending from said first sealing surface, said first projection defining a closeable leak path across said first sealing surface; a second ring having a second peripheral wall extending circumferentially around said second ring, said second ring being received within said second receptacle; a second lobe attached to said second peripheral wall, said second lobe extending circumferentially around said second ring; a second sealing surface positioned on said second lobe, said second sealing surface extending circumferentially around said second ring; a tube connecting said first and second rings to one another and extending along said fluid path; a plurality of adjustable connection members attaching said first and second housing portions to one another, said housing portions being supported in spaced apart relation sufficient to permit said pipe elements to be inserted into said receptacles while said housing portions are attached to one another, said first and second sealing surfaces respectively contacting said pipe elements, said first projection engaging one of said pipe elements and maintaining a portion of said first sealing surface in spaced relation away therefrom, each said connection member being adjustably tightenable so as to draw said housing portions toward one another and compress said portion of said first sealing surface into sealing engagement with said one pipe element thereby closing said leak path.

[0005] The invention concerns a seal. In one example embodiment the seal comprises a ring having a peripheral wall extending circumferentially therearound. A first lobe is attached to the peripheral wall. The first lobe extends circumferentially around the ring. A first sealing surface is positioned on the first lobe. The first sealing surface extends circumferentially around the ring. At least a first projection extends from the first sealing surface. The first projection defines a closeable leak path across the first sealing surface.

[0006] By way of example, the first lobe may comprise a free edge, the first projection being positioned proximate to the free edge. In another example the first lobe comprises a free edge, the first projection being positioned distal to the free edge. Further by way of example, the seal comprises at least a second projection extending from the first sealing surface, the second projection defining a closeable leak path across the first sealing surface.

What is claimed is:

1. A seal, comprising: a first ring having a first peripheral wall extending circumferentially therearound; a first lobe attached to said first peripheral wall, said first lobe extending circumferentially around said first ring; a first sealing surface positioned on said first lobe, said first sealing surface extending circumferentially around said first ring; at least a first projection extending from said first sealing surface, said first projection defining a closeable leak path across said first sealing surface; a second ring having a second peripheral wall extending circumferentially around said second ring; a second lobe attached to said second peripheral wall, said second lobe extending circumferentially around said second ring; a second sealing surface positioned on said second lobe, said second sealing surface extending circumferentially around said second ring; and a tube connecting said first and second rings to one another.

2. The seal according to claim 1, wherein said first lobe comprises a free edge, said first projection being positioned proximate to said free edge.

3. The seal according to claim 1, wherein said first lobe comprises a free edge, said first projection being positioned distal to said free edge.

4. The seal according to claim 1, further comprising at least a second projection extending from said first sealing surface, said second projection defining a closeable leak path across said first sealing surface.

5. The seal according to claim 4, wherein said first lobe comprises a free edge, said first and second projections being positioned proximate to said free edge.

6. The seal according to claim 5, wherein said first and second projections are positioned adjacent to one another.

7. The seal according to claim 5, wherein said first and second projections are positioned in spaced relation to one another angularly about said ring.

8. The seal according to claim 7, wherein said first and second projections are positioned 180° apart from one another.

9. The seal according to claim 4, wherein said first lobe comprises a free edge, said first and second projections being positioned distal to said free edge.

10. The seal according to claim 9, wherein said first and second projections are positioned adjacent to one another.

11. The seal according to claim 9, wherein said first and second projections are positioned in spaced relation to one another angularly about said ring.

12. The seal according to claim 11, wherein said first and second projections are positioned 180° apart from one another.

13. The seal according to claim 4, wherein said first lobe comprises a free edge, said first projection being positioned adjacent to said free edge, said second projection being positioned distal to said free edge.

14. The seal according to claim 13, wherein said first and second projections are positioned adjacent to one another.

15. The seal according to claim 13, wherein said first and second projections are positioned in spaced relation to one another angularly about said ring.

16. The seal according to claim 15, wherein said first and second projections are positioned 180° apart from one another.

17. The seal according to claim 1, wherein said first projection has a convexly curved shape.

18. The seal according to claim 17, wherein said first projection has a hemispherical shape.

19. The seal according to claim 6, further comprising third and fourth projections extending from said first sealing surface, said third and fourth projections defining respective closeable leak paths across said first sealing surface.

20. The seal according to claim 19, wherein said third and fourth projections are positioned adjacent to one another proximate to said free edge.

21. The seal according to claim 19, wherein said third and fourth projections are positioned adjacent to one another distal to said free edge.

22. The seal according to claim 19, wherein said third and fourth projections are positioned in spaced relation to said first and second projections angularly about said ring.

23. The seal according to claim 22, wherein said third and fourth projections are positioned 180° apart from said first and second projections.

24. The seal according to claim 1, further comprising at least a second projection extending from said second sealing surface.

25. The seal according to claim 1, wherein said first and second rings are oriented angularly with respect to one another.

26. The seal according to claim 25, wherein said first and second rings have an orientation angle of 90°.

27. A fitting for connecting at least two pipe elements together, said fitting comprising: first and second housing portions attached to one another and defining at least first

and second receptacles for receiving said pipe elements, said housing portions further defining a fluid path extending between said first and second receptacles; a seal positioned between said first and second housing portions, said seal comprising: a first ring having a first peripheral wall extending circumferentially therearound, said first ring being received within said first receptacle; a first lobe attached to said first peripheral wall, said first lobe extending circumferentially around said first ring; a first sealing surface positioned on said first lobe, said first sealing surface extending circumferentially around said first ring; at least a first projection extending from said first sealing surface, said first projection defining a closeable leak path across said first sealing surface; a second ring having a second peripheral wall extending circumferentially around said second ring, said second ring being received within said second receptacle; a second lobe attached to said second peripheral wall, said second lobe extending circumferentially around said second ring; a second sealing surface positioned on said second lobe, said second sealing surface extending circumferentially around said second ring; a tube connecting said first and second rings to one another and extending along said fluid path; a plurality of adjustable connection members attaching said first and second housing portions to one another, said housing portions being supported in spaced apart relation sufficient to permit said pipe elements to be inserted into said receptacles while said housing portions are attached to one another, said first and second sealing surfaces respectively contacting said pipe elements, said first projection engaging one of said pipe elements and maintaining a portion of said first sealing surface in spaced relation away therefrom, each said connection member being adjustably tightenable so as to draw said housing portions toward one another and compress said portion of said first sealing surface into sealing engagement with said one pipe element thereby closing said leak path.

28. The fitting according to claim 27, wherein said housing portions are supported in a pre-assembled state on said seal in spaced apart relation from one another sufficient to permit said pipe elements to be inserted into said receptacles.

29. The fitting according to claim 27, wherein said first lobe comprises a free edge, said first projection being positioned proximate to said free edge.

30. The fitting according to claim 27, wherein said first lobe comprises a free edge, said first projection being positioned distal to said free edge.

31. The fitting according to claim 27, further comprising at least a second projection extending from said first sealing surface, said second projection defining a closeable leak path across said first sealing surface.

32. The fitting according to claim 31, wherein said first lobe comprises a free edge, said first and second projections being positioned proximate to said free edge.

33. The fitting according to claim 32, wherein said first and second projections are positioned adjacent to one another.

34. The fitting according to claim 32, wherein said first and second projections are positioned in spaced relation to one another angularly about said ring.

35. The fitting according to claim 34, wherein said first and second projections are positioned 180° apart from one another.

36. The fitting according to claim 31, wherein said first lobe comprises a free edge, said first and second projections being positioned distal to said free edge.

37. The fitting according to claim 36, wherein said first and second projections are positioned adjacent to one another.

38. The fitting according to claim 36, wherein said first and second projections are positioned in spaced relation to one another angularly about said ring.

39. The fitting according to claim 38, wherein said first and second projections are positioned 180° apart from one another.

40. The fitting according to claim 31, wherein said first lobe comprises a free edge, said first projection being positioned adjacent to said free edge, said second projection being positioned distal to said free edge.

41. The fitting according to claim 40, wherein said first and second projections are positioned adjacent to one another.

42. The fitting according to claim 40, wherein said first and second projections are positioned in spaced relation to one another angularly about said ring.

43. The fitting according to claim 42, wherein said first and second projections are positioned 180° apart from one another.

44. The fitting according to claim 27, wherein said first projection has a convexly curved shape.

45. The fitting according to claim 44, wherein said first projection has a hemispherical shape.

46. The fitting according to claim 33, further comprising third and fourth projections extending from said first sealing surface, said third and fourth projections defining respective closeable leak paths across said first sealing surface.

47. The fitting according to claim 46, wherein said third and fourth projections are positioned adjacent to one another proximate to said free edge.

48. The fitting according to claim 46, wherein said third and fourth projections are positioned adjacent to one another distal to said free edge.

49. The fitting according to claim 46, wherein said third and fourth projections are positioned in spaced relation to said first and second projections angularly about said ring.

50. The fitting according to claim 49, wherein said third and fourth projections are positioned 180° apart from said first and second projections.

51. The fitting according to claim 27, further comprising at least a second projection extending from said second sealing surface, said second projection defining a closeable leak path across said second sealing surface.

52. The fitting according to claim 27, wherein said first and second rings are oriented angularly with respect to one another.

53. The fitting according to claim 52, wherein said first and second rings have an orientation angle of 90°.