

What is claimed is:

1. A valve, comprising:

a plurality of segments attached end to end surrounding a central space,
each of said segments having first and second circumferentially arranged projections
5 extending toward said central space;

a valve body positioned within said central space, said valve body
having an outer surface facing said segments and an inner surface defining a bore
therethrough, said first and second circumferentially arranged projections being
engageable with said outer surface for securing said valve body within said central
10 space;

a closing member positioned within said bore, said closing member
being movable between an open and a closed configuration;

a stem attached to said closing member for moving said closing
member between said open and said closed configuration; and

15 first and second connection members positioned at opposite ends of at
least two of said segments for effecting end to end attachment of said segments.

2. The valve according to claim 1, further comprising a liner overlying said
inner surface of said valve body and surrounding said bore, said liner sealingly
engaging said closing member when in said closed configuration.

20 3. The valve according to claim 2, wherein said liner further comprises a ring
having first and second lobes positioned on opposite sides thereof, a portion of said
first lobe surrounding a first portion of said outer surface of said valve body, said first
projections engaging said first portion of said first lobe, a portion of said second lobe
surrounding a second portion of said outer surface of said valve body, said second
25 projections engaging said second portion of said second lobe.

4. The valve according to claim 3, wherein:

each of said segments comprises a channel extending circumferentially around and facing said central space, each of said channels being defined by first and second side surfaces located on opposite sides of said segments and a back surface

5 extending between said side surfaces;

said first lobe having a first lobe surface facing toward said first side surface and said second lobe having a second lobe surface facing toward said second side surface; wherein

when said lobes are seated within said channel, at least a portion of
10 said first and second lobe surfaces come into contact respectively with said first and second side surfaces such that said lobes deform toward a center of said channel.

5. The valve according to claim 4, wherein said first lobe surface is oriented angularly with respect to said first side surface and said second lobe surface is oriented angularly with respect to said second side surface when said lobes are
15 undeformed.

6. The valve according to claim 4, wherein said first and second lobe surfaces comprise convexly curved surfaces when said lobes are undeformed.

7. The valve according to claim 2, wherein:

each of said segments comprises a channel extending circumferentially
20 around and facing said central space, each of said channels being defined by first and second side surfaces located on opposite sides of said segments and a back surface extending between said side surfaces;

a shroud is positioned between said valve body and said segments, said shroud comprising a ring having first and second lobes positioned on opposite sides
25 thereof, said first lobe having a first lobe surface facing toward said first side surface and said second lobe having a second lobe surface facing toward said second side

surface, said first projections engaging said first lobe, said second projections engaging said second lobe; wherein

when said shroud is seated within said channels, at least a portion of said first and second lobe surfaces come into contact respectively with said first and second side surfaces such that said lobes deform toward a center of said channel.

8. The valve according to claim 7, wherein said first lobe surface is oriented angularly with respect to said first side surface and said second lobe surface is oriented angularly with respect to said second side surface when said lobes are undeformed.

9. The valve according to claim 7, wherein said first and second lobe surfaces comprise convexly curved surfaces when said lobes are undeformed.

10. The valve according to claim 7, wherein a portion of said liner extends between said valve body and said first and second segments, said shroud sealingly engaging said portion of said liner.

11. The valve according to claim 1, comprising only two of said segments.

12. The valve according to claim 1, wherein said closing member comprises a disk rotatably mounted within said valve body.

13. The valve according to claim 1, wherein each of said segments further comprises first and second keys positioned on opposite sides of said segments, each of said keys extending circumferentially around and projecting toward said central space.

14. The valve according to claim 13, wherein each of said keys comprises an arcuate surface engageable with a pipe element positioned within said central space.

15. The valve according to claim 3, further comprising:

a first support body positioned adjacent to said first connection member, said first support body having a surface facing said valve body and first and

second posts in spaced apart relation extending away from said central space, said first post engaging a first segment, said second post engaging a second segment;

a second support body positioned adjacent to said second connection member, said second support body having a surface facing said valve body and first
5 and second posts in spaced apart relation extending away from said central space, said first post of said second support body engaging said first segment, said second post of said second support body engaging said second segment; wherein

said surfaces of said first and second support bodies engage said liner, said posts engage said segments, whereby said first and second support bodies
10 cooperate with said liner to support said first and second segments in spaced apart relation in a pre-assembled configuration.

16. The valve according to claim 15, wherein said first and second support bodies comprise a plurality of teeth projecting toward said central space, said teeth being arranged on opposite sides of said valve body for engaging pipe elements
15 positioned within said central space when said connection members are adjustably tightened to draw said segments toward one another.

17. The valve according to claim 15, further comprising:

first and second springs positioned adjacent to opposite ends of said first support body, said first spring being positioned between said valve body and said
20 first segment, said second spring being positioned between said valve body and said second segment;

third and fourth springs positioned adjacent to opposite ends of said second support body, said third spring being positioned between said valve body and said first segment, said fourth spring being positioned between said valve body and
25 said second segment.

18. The valve according to claim 17, wherein:

said first and second springs are attached to said first support body; and
said third and fourth springs are attached to said second support body.

19. The valve according to claim 17, further comprising:

a circumferential ridge extending around said valve body, said springs acting between said circumferential ridge and said first and second segments.

20. The valve according to claim 19, wherein each of said springs has a “W” cross sectional shape comprising a vertex positioned between first and second legs on
5 opposite sides of said vertex, for each of said springs said vertex receiving said circumferential ridge, said legs of said first and third springs engaging said first segment, and said legs of said second and fourth springs engaging said second segment.

10 21. The valve according to claim 3, further comprising:

a first support body positioned adjacent to said first connection member, said first support body having a surface facing said valve body and a boss extending away from said central space, said boss engaging a first and a second segment;

15 a second support body positioned adjacent to said second connection member, said second support body having a surface facing said valve body and a second boss extending away from said central space, said second boss engaging said first and second segments; wherein

said surfaces of said first and second support bodies engage said liner,
20 said bosses engage said segments, whereby said first and second support bodies cooperate with said liner to support said first and second segments in spaced apart relation in a pre-assembled configuration.

22. The valve according to claim 21, wherein said first and second support
25 bodies comprise a plurality of teeth projecting toward said central space, said teeth being arranged on opposite sides of said valve body for engaging pipe elements positioned within said central space when said connection members are adjustably tightened to draw said segments toward one another.

23. The valve according to claim 21, further comprising:

first and second springs positioned adjacent to opposite ends of said first support body, said first spring being positioned between said valve body and said first segment, said second spring being positioned between said valve body and said second segment;

third and fourth springs positioned adjacent to opposite ends of said second support body, said third spring being positioned between said valve body and said first segment, said fourth spring being positioned between said valve body and said second segment.

24. The valve according to claim 23, wherein:

said first and second springs are attached to said first support body; and
said third and fourth springs are attached to said second support body.

25. The valve according to claim 23, further comprising:

a circumferential ridge extending around said valve body, said springs acting between said circumferential ridge and said first and second segments.

26. The valve according to claim 25, wherein each of said springs has a “W” cross sectional shape comprising a vertex positioned between first and second legs on opposite sides of said vertex, for each of said springs said vertex receiving said circumferential ridge, said legs of said first and third springs engaging said first segment, and said legs of said second and fourth springs engaging said second segment.

27. The valve according to claim 21, further comprising:

a first fastener extending between said boss of said first support body and said valve body;

a second fastener extending between said boss of said second support body and said valve body, said fasteners attaching said first and second support bodies to said valve body.

28. The valve according to claim 21, further comprising:

a first spring acting between said valve body and said boss of said first support body;

a second spring acting between said valve body and said boss of said second support body, said first and second springs respectively biasing said first and second support bodies away from said valve body.

29. The valve according to claim 1, wherein said projections are
5 circumferentially continuous.

30. The valve according to claim 1, wherein said projections are circumferentially intermittent.

31. A valve, comprising:

a plurality of segments attached end to end surrounding a central
10 space;

a valve body positioned within said central space, said valve body having an outer surface facing said segments and an inner surface defining a bore therethrough;

a closing member positioned within said bore, said closing member
15 being movable between an open and a closed configuration;

a liner overlying said inner surface of said valve body and surrounding said bore, said liner sealingly engaging said closing member when in said closed configuration;

a stem attached to said closing member for moving said closing
20 member between said open and said closed configuration; and

first and second connection members positioned at opposite ends of at least two of said segments for effecting end to end attachment of said segments.

32. The valve according to claim 31, wherein each of said segments comprises first and second circumferentially arranged projections extending toward
25 said central space, said first and second circumferentially arranged projections being engageable with said outer surface of said valve body for securing said valve body within said central space.

33. The valve according to claim 31, wherein said liner further comprises a ring having first and second lobes positioned on opposite sides thereof, a portion of said first lobe surrounding a first portion of said outer surface of said valve body, said first projections engaging said first portion of said first lobe, a portion of said second lobe surrounding a second portion of said outer surface of said valve body, said second projections engaging said second portion of said second lobe.

34. The valve according to claim 33, wherein:

each of said segments comprises a channel extending circumferentially around and facing said central space, each of said channels being defined by first and second side surfaces located on opposite sides of said segments and a back surface extending between said side surfaces;

said first lobe having a first lobe surface facing toward said first side surface and said second lobe having a second lobe surface facing toward said second side surface; wherein

when said lobes are seated within said channel, at least a portion of said first and second lobe surfaces come into contact respectively with said first and second side surfaces such that said lobes deform toward a center of said channel.

35. The valve according to claim 34, wherein said first lobe surface is oriented angularly with respect to said first side surface and said second lobe surface is oriented angularly with respect to said second side surface when said lobes are undeformed.

36. The valve according to claim 34, wherein said first and second lobe surfaces comprise convexly curved surfaces when said lobes are undeformed.

37. The valve according to claim 31, wherein:

each of said segments comprises a channel extending circumferentially around and facing said central space, each of said channels being defined by first and

second side surfaces located on opposite sides of said segments and a back surface extending between said side surfaces;

a shroud is positioned between said valve body and said segments, said shroud comprising a ring having first and second lobes positioned on opposite sides thereof, said first lobe having a first lobe surface facing toward said first side surface and said second lobe having a second lobe surface facing toward said second side surface, said first projections engaging said first lobe, said second projections engaging said second lobe; wherein

when said shroud is seated within said channels, at least a portion of said first and second lobe surfaces come into contact respectively with said first and second side surfaces such that said lobes deform toward a center of said channel.

38. The valve according to claim 37, wherein said first lobe surface is oriented angularly with respect to said first side surface and said second lobe surface is oriented angularly with respect to said second side surface when said lobes are undeformed.

39. The valve according to claim 37, wherein said first and second lobe surfaces comprise convexly curved surfaces when said lobes are undeformed.

40. The valve according to claim 37, wherein a portion of said liner extends between said valve body and said first and second segments, said shroud sealingly engaging said portion of said liner.

41. The valve according to claim 31, comprising only two of said segments.

42. The valve according to claim 31, wherein said closing member comprises a disk rotatably mounted within said valve body.

43. The valve according to claim 31, wherein each of said segments further comprises first and second keys positioned on opposite sides of said segments, each of said keys extending circumferentially around and projecting toward said central space.

44. The valve according to claim 43, wherein each of said keys comprises an arcuate surface engageable with a pipe element positioned within said central space.

45. The valve according to claim 31, further comprising:

a first support body positioned adjacent to said first connection
5 member, said first support body having a surface facing said valve body and first and second posts in spaced apart relation extending away from said central space, said first post engaging a first segment, said second post engaging a second segment;

a second support body positioned adjacent to said second connection
member, said second support body having a surface facing said valve body and first
10 and second posts in spaced apart relation extending away from said central space, said first post of said second support body engaging said first segment, said second post of said second support body engaging said second segment; wherein

said first and second support bodies cooperate with said liner to
support said first and second segments in spaced apart relation in a pre-assembled
15 configuration.

46. The valve according to claim 45, wherein said first and second support bodies comprise a plurality of teeth projecting toward said central space, said teeth being arranged on opposite sides of said valve body for engaging pipe elements positioned within said central space when said connection members are adjustably
20 tightened to draw said segments toward one another.

47. The valve according to claim 45, further comprising:

first and second springs positioned adjacent to opposite ends of said first support body, said first spring being positioned between said valve body and said first segment, said second spring being positioned between said valve body and said
25 second segment;

third and fourth springs positioned adjacent to opposite ends of said second support body, said third spring being positioned between said valve body and said first segment, said fourth spring being positioned between said valve body and said second segment.

48. The valve according to claim 47, wherein:

said first and second springs are attached to said first support body; and
said third and fourth springs are attached to said second support body.

49. The valve according to claim 47, further comprising:

5 a circumferential ridge extending around said valve body, said springs
acting between said circumferential ridge and said first and second segments.

50. The valve according to claim 49, wherein each of said springs has a “W”
cross sectional shape comprising a vertex positioned between first and second legs on
opposite sides of said vertex, for each of said springs said vertex receiving said
10 circumferential ridge, said legs of said first and third springs engaging said first
segment, and said legs of said second and fourth springs engaging said second
segment.

51. The valve according to claim 31, further comprising:

a first support body positioned adjacent to said first connection
15 member, said first support body having a surface facing said valve body and a boss
extending away from said central space, said boss engaging a first and a second
segment;

a second support body positioned adjacent to said second connection
member, said second support body having a surface facing said valve body and a
20 second boss extending away from said central space, said second boss engaging said
first and second segments; wherein

said first and second bodies cooperate with said liner to support said
first and second segments in spaced apart relation in a pre-assembled configuration.

52. The valve according to claim 51, wherein said first and second support
25 bodies comprise a plurality of teeth projecting toward said central space, said teeth
being arranged on opposite sides of said valve body for engaging pipe elements
positioned within said central space when said connection members are adjustably
tightened to draw said segments toward one another.

53. The valve according to claim 51, further comprising:

first and second springs positioned adjacent to opposite ends of said first support body, said first spring being positioned between said valve body and said first segment, said second spring being positioned between said valve body and said second segment;

5 third and fourth springs positioned adjacent to opposite ends of said second support body, said third spring being positioned between said valve body and said first segment, said fourth spring being positioned between said valve body and said second segment.

54. The valve according to claim 53, wherein:

10 said first and second springs are attached to said first support body; and said third and fourth springs are attached to said second support body.

55. The valve according to claim 53, further comprising:

a circumferential ridge extending around said valve body, said springs acting between said circumferential ridge and said first and second segments.

15 56. The valve according to claim 55, wherein each of said springs has a “W” cross sectional shape comprising a vertex positioned between first and second legs on opposite sides of said vertex, for each of said springs said vertex receiving said circumferential ridge, said legs of said first and third springs engaging said first segment, and said legs of said second and fourth springs engaging said second
20 segment.

57. The valve according to claim 51, further comprising:

a first fastener extending between said boss of said first support body and said valve body;

a second fastener extending between said boss of said second support
25 body and said valve body, said fasteners attaching said first and second bodies to said valve body.

58. The valve according to claim 51, further comprising:

a first spring acting between said valve body and said boss of said first support body;

30 a second spring acting between said valve body and said boss of said second support body, said first and second springs respectively biasing said first and second support bodies away from said valve body.

59. The valve according to claim 52, wherein said projections are circumferentially continuous.

60. The valve according to claim 52, wherein said projections are circumferentially intermittent.

5 61. A seal for a valve having a valve closing member, said seal comprising:
 a ring having an inner surface surrounding a bore, said inner surface
 being sealingly engageable with said valve closing member;

 first and second lobes positioned on opposite sides of said ring, said
 lobes extending circumferentially around said ring and projecting in opposite
10 directions from one another along an axis coaxial with said bore; wherein each said
 lobe comprises:

 a band having a first edge attached to said ring and a second oppositely
 disposed edge comprising a sealing surface facing said axis.

15 62. The seal according to claim 61, wherein each said band has an arcuate
 cross sectional shape.

 63. The seal according to claim 61 wherein each said band is angularly
 oriented with respect to said axis.

 64. The seal according to claim 61, further comprising:
 a first strip having a first edge attached to said ring adjacent to said
20 first band;

 a second strip having a second edge attached to said ring adjacent to
 said second band; wherein

 said first and second strips extend circumferentially around said ring
 and project toward one another.

25 65. The seal according to claim 64, wherein said first and second strips
 project parallel to said axis.

 66. A method of joining pipe elements using a valve comprising a plurality of
 segments attached end to end surrounding a central space and a valve body positioned
 within said central space, said method comprising:

30 inserting said pipe elements into said central space from opposite sides
 of said valve;

drawing said segments toward said central space so as to engage said segments with said pipe elements;

while drawing said segments toward said central space, engaging projections on said segments with said valve body.

5 67. The method according to claim 66, wherein said engaging said projections with said valve body comprises circumferentially contacting said valve body with first and second circumferentially arranged projections extending from said segments toward said central space.

10 68. The method according to claim 66, further comprising centering said valve body within said central space by engaging projections on said segments with grooves in said valve body.

15 69. The method according to claim 68, wherein said engaging said projections on said segments with grooves in said valve body comprises circumferentially contacting circumferential grooves in said valve body with first and second circumferentially arranged projections extending from said segments toward said central space.