What is claimed is:

1. A seal locking assembly for use with a wellhead assembly, comprising:

an annular seal;

an energizing ring having a nose and a sidewall, selectively insertable into an annular space in the annular seal; and

an annular recess located on the sidewall;

so that when the annular seal deforms from a first shape to a second shape in response to force exerted against the annular seal, at least a portion of the annular seal occupies the recess when the annular seal is in the second shape.

2. The seal locking assembly according to Claim 1, wherein when in the second shape a portion of the seal bulges into the recess and creates an interference lock between the seal and the energizing ring that prevents axial movement of the energizing ring relative to the annular seal in at least one axial direction.

3. The seal locking assembly according to Claim 2, wherein the interference lock prevents axial movement of the energizing ring relative to the annular seal in both axial directions.

4. The seal locking assembly according to Claim 1, wherein the annular seal comprises a u-shaped seal having an inner leg and an outer leg defining the space therebetween, and upon occupying the space, the energizing ring urges the inner and outer legs into sealing engagement with the sealing surface and with another sealing surface, respectively.

5. The seal locking assembly according to Claim 1, wherein the annular recess comprises an outward and upward facing tapered surface.

6. The seal locking assembly according to Claim 5, wherein the second shape of the annular seal engages the outward and upward facing tapered surface.

7. The seal locking assembly according to Claim 1, wherein, once the annular seal has assumed the second shape, the energizing ring can be disengaged only by deformation of one of the energizing ring and the annular seal.

8. A wellhead assembly comprising:

an outer tubular wellhead member having an outer sealing surface;

an inner tubular wellhead member within the outer tubular wellhead member and having an inner sealing surface;

a seal pocket between the inner and outer tubular wellhead members;

an annular seal disposed within the seal pocket;

an annular energizing ring inserted into a space in the seal and having a sidewall and a nose on a lower end of the sidewall; and

an annular recess located on the sidewall for engaging the seal when the seal deforms from a first shape to a second shape, the second shape defining a deformed seal.

9. The wellhead assembly according to Claim 8, wherein the annular seal is deformable from the first shape to a second shape in response to upward movement of the inner tubular wellhead member, and the second shape creates an interference lock on the annular recess.

10. The wellhead assembly according to Claim 8, wherein engagement between the recess and the deformed seal blocks upward movement of the energizing ring.

11. The wellhead assembly according to Claim 8, wherein when the seal deforms, a portion of the seal protrudes into the recess.

12. The wellhead assembly according to Claim 8, wherein the annular seal comprises a u-shaped seal having an inner leg and an outer leg defining a gap therebetween, and upon occupying the gap, the energizing ring urges the inner and outer legs into sealing engagement with the inner sealing surface and the outer sealing surface, respectively.

13. The wellhead assembly according to Claim 8, wherein the annular recess comprises an outward and upward facing tapered surface.

14. The wellhead assembly according to Claim 13, wherein the second shape of the annular seal engages the outward and upward facing tapered surface.

15. The wellhead assembly according to Claim 14, wherein the energizing ring is restricted from upward movement when the annular seal engages the outward and upward facing tapered surface.

16. The wellhead assembly according to Claim 8, wherein the interference lock is disengaged by deforming one of the energizing ring and the annular seal.

17. A method for forming a locking seal between two annular members, the method comprising:

providing an outer tubular wellhead member having an outer sealing surface and an inner tubular wellhead member adapted to land within the outer tubular wellhead member, defining a seal pocket between them, the inner tubular wellhead member having an inner sealing surface;

positioning an annular seal within the seal pocket; and

energizing the annular seal with an energizing ring by urging at least a portion of the annular seal against one of the sealing surfaces, the energizing ring having an annular recess located on the sidewall below the forcing surface.

18. The method according to Claim 17, further comprising the step of deforming the annular seal until a deformed portion of the annular seal occupies at least a portion of the annular recess.

19. The method according to Claim 18, further comprising the step of destructively deforming one of the annular seal and the energizing ring while withdrawing the energizing ring from the annular seal.

20. The method according to Claim 18, wherein the annular seal is deformed in response to upward force exerted against the inner tubular wellhead member.

CLAIMS

1. A seal locking assembly for use with a wellhead assembly, comprising:

an annular seal having a leg that is selectively axially compressed from a first shape that is axially uncompressed to a second shape that is axially compressed;

a bulge that projects radially inward from the leg when the leg is in the second shape; and

an energizing ring having a nose and a sidewall, selectively insertable into an annular space in the annular seal; and

an annular recess located on the sidewall that receives the bulge.

2. The seal locking assembly according to claim 1, wherein when in the second shape a portion of the seal bulges into the recess and creates an interference lock between the seal and the energizing ring that prevents axial movement of the energizing ring relative to the annular seal in at least one axial direction.

3. The seal locking assembly according to claim 2, wherein the interference lock prevents axial movement of the energizing ring relative to the annular seal in both axial directions.

4. The seal locking assembly according to claim 1, wherein the leg comprises an inner leg, and wherein the annular seal comprises a u-shaped seal having the inner leg and an outer leg defining the space therebetween, and upon occupying the space, the energizing ring urges the inner and outer legs into sealing engagement with the sealing surface and with another sealing surface, respectively.

5. The seal locking assembly according to claim 1, wherein the annular recess comprises an outward and upward facing tapered surface.

6. The seal locking assembly according to claim 5, wherein the second shape of the annular seal engages the outward and upward facing tapered surface.

7. The seal locking assembly according to claim 1, wherein, once the annular seal has assumed the second shape, the energizing ring can be disengaged only by deformation of one of the energizing ring and the annular seal.

8. A wellhead assembly comprising:

an outer tubular wellhead member having an outer sealing surface;

an inner tubular wellhead member within the outer tubular wellhead member and having an inner sealing surface;

a seal pocket between the inner and outer tubular wellhead members;

an annular seal disposed within the seal pocket and that is axially compressible from a first shape to a deformed second shape that has a radially projecting bulge;

an annular energizing ring inserted into a space in the seal and having a sidewall and a nose on a lower end of the sidewall; and

an annular recess located on the sidewall that receives the bulge when the seal is in the second shape for engaging the seal when the seal deforms.

9. The wellhead assembly according to claim 8, wherein the annular seal is deformable from the first shape to the second shape in response to upward movement of the inner tubular wellhead member, and the second shape creates an interference lock on the annular recess.

10. The wellhead assembly according to claim 8, wherein engagement between the recess and the deformed seal blocks upward movement of the energizing ring.

11. The wellhead assembly according to claim 8, wherein when the seal deforms, a portion of the seal protrudes into the recess.

12. The wellhead assembly according to claim 8, wherein the annular seal comprises a u-shaped seal having an inner leg and an outer leg defining a gap therebetween, and upon occupying the gap, the energizing ring urges the inner and outer legs into sealing engagement with the inner sealing surface and the outer sealing surface, respectively.

13. The wellhead assembly according to claim 8, wherein the annular recess comprises an outward and upward facing tapered surface.

14. The wellhead assembly according to claim 13, wherein the second shape of the annular seal engages the outward and upward facing tapered surface.

15. The wellhead assembly according to claim 14, wherein the energizing ring is restricted from upward movement when the annular seal engages the outward and upward facing tapered surface.

16. The wellhead assembly according to claim 8, wherein the interference lock is disengaged by deforming one of the energizing ring and the annular seal.

17. A method for forming a locking seal between two annular members, the method comprising:

providing an outer tubular wellhead member having an outer sealing surface and an inner tubular wellhead member adapted to land within the outer tubular

wellhead member, defining a seal pocket between them, the inner tubular wellhead member having an inner sealing surface;

positioning an annular seal within the seal pocket; and

deforming the seal by energizing the annular seal with an axial force from an energizing ring by urging at least a portion of the annular seal against one of the sealing surfaces, the energizing ring having that has annular recess located on the sidewall below a forcing surface, so that when the seal is deformed, a bulge forms on the seal and projects into the recess.

18. The method according to claim 17, further comprising the step of destructively deforming one of the annular seal and the energizing ring while withdrawing the energizing ring from the annular seal.

19. The method according to claim 17, wherein the annular seal is deformed in response to upward force exerted against the inner tubular wellhead member.