**WHAT IS CLAIMED IS:**

1. A wellhead assembly with an axis, characterized by:

an outer wellhead member (10) having a bore (11);

an inner wellhead member (15) in the bore (11);

an annular space (17) between the inner and outer wellhead members (15, 10);

a seal member (23) having inner and outer annular walls (25, 29) defining a slot (35) therebetween; and,

an annular energizing ring (41) in the slot (35) and having a lower end (61) with a tapered surface (80) at an angle oblique to an axis of the ring (41) and extending laterally from the axis of the ring (41) so that when the ring (41) is inserted into the slot (35) the tapered surface (80) contacts an upper edge (76) of one of the walls (25, 29).

2. The assembly according to claim 1, further characterized by:

a set of wickers (12, 18) formed in at least one of the seal surfaces, a smooth cylindrical surface (11, 17) adjoining the set of wickers (12, 18); and

opposing seal surfaces in the bore (11) and on an exterior portion (17) of the inner wellhead member (15).

3. The assembly according to claim 1, further characterized by an extension (100) fastened to a lower end of the seal member (23).

4. The assembly according to claim 3, further characterized by a pair of metal rings (102, 104) bonded to either side of a seal element (106), a back of one of the metal rings

(102) connected to a lower end of the extension (100) connected to the seal ring (23), a back of the other metal ring (104) connected to a top end of a landing extension (108), wherein the landing extension (108) provides a surface for contacting a reaction point (110) during installation.

5. The assembly according to claim 1, further characterized by a seal element (106) located between the seal member (23) and a landing extension (108) that extends downward, wherein the angle of the tapered surface (80) is formed so that the seal element (106) is compressed and bulges outward to sealingly engage the outer wellhead member (10) before the energizing ring (41) inserts into the slot (35).

6. The assembly according to claim 1, wherein the tapered surface (80) is a first tapered surface, the assembly further comprising a second tapered surface (72) adjacent the first tapered surface (80) on a side opposite a lower terminal end (61) of the ring (41), wherein an angle (74) between the second tapered surface (72) and the ring axis is less than the angle between the first tapered surface (80) and axis.

7. The assembly according to claim 6, wherein the first and second tapered surfaces (80, 72) are on inner and outer sides (63, 65) of the energizing ring (41).

8. The assembly according to claim 1, wherein the inner and outer walls (25, 29) have a tapered upward facing shoulder (76) and the shoulder (76) is contacted by the tapered surface (80) of the energizing ring (41).

9. The assembly according to claim 1, wherein the tapered surface (80) formed on a nose end (61) of the energizing ring (41) has a taper that can vary from about 90 degrees to 0 degrees from the axis of the ring (41).

10. The assembly according to claim 6, wherein the second tapered surface (72) has a taper that can vary from about 0 degrees to about 30 degrees from the axis of the ring (41).

11. The assembly according to claim 1, wherein a tapered upward facing shoulder (76) formed on the inner and outer walls (25, 29) of the seal member (23) has an area that distributes a force applied to the energizing ring (41) so that sliding engagement of the energizing ring (41) with the inner and outer walls (25, 29) is delayed until a seal element (106) is compressed and forms a pressure barrier in the annular space (17).

12. A method for sealing an annular space (17) in a wellhead assembly, characterized by:

providing a seal assembly (21) comprising an outer wellhead member (10) having a bore (11), an inner wellhead member (15) in the bore (11), an annular space (17) between the inner and outer wellhead members (15, 10), a seal member (23) having inner and outer annular walls (25, 29) defining a slot (35) therebetween, an annular energizing ring (41) in the slot (35) and having a lower end (61) with a tapered surface (80) at an angle oblique to an axis of the ring (41) and extending laterally from the axis of the ring

(41) so that when the ring (41) is inserted into the slot (35) the tapered surface (80) contacts an upper edge (76) of one of the walls (25, 29); and a pliable seal (106) on lower end of seal assembly (21);

inserting the seal (23) into the space;

contacting tapered surface (80) with an upper surface (76) of a leg (27, 31);

forming a seal with the pliable seal (106) by applying a downward force on the energizing ring (41) to compress and deform the pliable seal (106);

inserting energizing ring (41) into slot (35) by increasing the downward force on the energizing ring (41) to overcome a reactive force at an interface where the tapered surface (80) contacts the upper surface (76) of the leg (27, 31).

13. The method according to claim 12, wherein the tapered surface (80) is a first tapered surface, the assembly further comprising a second tapered surface (72) adjacent the first tapered surface (80) on a side opposite a lower terminal end (61) of the ring (41), wherein an angle (74) between the second tapered surface (72) and the ring axis is less than the angle between the first tapered surface (80) and axis.

14. The assembly according to claim 12, further characterized by providing a seal element (106) located between the seal member (23) and a landing extension (108) that extends downward, wherein the angle of the tapered surface (80) is formed so that the seal element (106) is compressed and bulges outward to sealingly engage the outer wellhead member (10) before the energizing ring (41) inserts into the slot (35).

15. The assembly according to claim 12, wherein,

the tapered surface (80) formed on a nose end (61) of the energizing ring (41) has a taper that can vary from about 90 degrees to 0 degrees from the axis of the ring (41); and

the second tapered surface (72) has a taper that can vary from about 0 degrees to about 30 degrees from the axis of the ring (41).

## CLAIMS

What is claimed is:

1. A wellhead assembly with an axis, comprising:

an outer wellhead member having a bore;

an inner wellhead member in the bore;

an annular space between the inner and outer wellhead members;

a metal seal member having inner and outer annular walls defining a slot therebetween;

an annular energizing ring having a lower end with at least one first tapered surface at a first angle relative to an axis of the ring, and at least one second tapered surface joining and extending upward from the first tapered surface at a second angle relative to the axis of the ring, the second angle being less than the first angle, each of the first and second tapered surfaces being straight frusto-conical surfaces;

at least one upward facing shoulder on at least one of the inner and outer annular walls that has a first tapered portion that is a straight frusto-conical surface and at the first angle relative to the axis, the first tapered surface of the energizing ring mating in flush contact with the first tapered portion of the upward facing shoulder while the energizing ring is in an unset position;

wherein the energizing member is movable from the unset position into the slot to a set position with the second tapered surface in the slot, which moves the inner and outer annular walls apart from each other into sealing engagement with the inner and outer wellhead members;

an elastomeric seal member fastened to a lower end of the metal seal member;

a landing shoulder within the annular space onto which the elastomeric seal member lands; and

wherein a downward force applied to the energizing ring while in the unset position transfers through the first tapered surface of the energizing ring to the first tapered portion of the upward facing shoulder in the metal seal member, causing the elastomeric seal member to sealingly engage the inner and outer annular wellhead members before the second tapered surface enters the slot.

2. The assembly according to claim 1,

wherein the second tapered surface has a greater axial length than an axial length of the first tapered surface.

3. The assembly according to claim 1, wherein the inner and outer annular walls are cylindrical from a lower end of the slot to the upward facing shoulder while the energizing ring is in the unset position.

4. The assembly according to claim 3, wherein the inner and outer annular walls within the slot deform to define a tapered portion that matches the second tapered surface when the energizing ring is in the set position.

5. The assembly according to claim 1, wherein:

the at least one first tapered surface comprises an outer first tapered surface on an outer side of the energizing ring and an inner first tapered surface on an inner side of the energizing ring;

the at least one second tapered surface comprises an outer second tapered surface on the outer side of the energizing ring and an inner second tapered surface on the inner side of the energizing ring; and

the at least one upward facing shoulder comprises an inner upward facing shoulder on the inner wall in the slot and an outer upward facing shoulder on the outer wall in the slot.

6. The assembly according to claim 1, further comprising:

a lower extension member integrally formed with the metal seal member and extending downward from one of the inner and outer annular walls; wherein

the elastomeric seal member has an elastomeric seal element and an upper extension member extending upward from the elastomeric seal element alongside and secured to the lower extension member.

7. The assembly according to claim 1, wherein the upward facing shoulder has a second tapered portion extending upward from the first tapered portion at a lesser angle relative to the axis than the first tapered portion.

8. The assembly according to claim 7, wherein the angle of the second tapered portion of the upward facing shoulder is greater than the second angle of the second tapered surface of the energizing ring.

9. A wellhead assembly with an axis, comprising:

an outer wellhead member having a bore;

an inner wellhead member in the bore;

an annular space between the inner and outer wellhead members;

a metal seal member having inner and outer annular walls defining a slot therebetween;

an upward facing shoulder on each of the annular walls at an upper end of and within the slot, each of the upward facing shoulders having a first tapered portion that is a straight frusto-conical surface formed at a first angle oblique to an axis of the metal seal member;

an annular energizing ring having a lower end with a first tapered surface on inner and outer sides of the energizing ring, each of the first tapered surfaces being a straight frusto-conical surface at the same first angle as the first tapered portions of the upward facing shoulders so as to mate in flush contact with the first tapered portions while the energizing ring is in an unset position;

a second tapered surface joining and extending upward from the first tapered surface on each of the inner and outer sides of the energizing ring, each of the second tapered surfaces being at a second angle relative to the axis that is less than the first angle;

an elastomeric seal member fastened to a lower end of the metal seal member;

a landing shoulder within the annular space onto which the elastomeric seal member lands; wherein

a downward force applied to the energizing ring while in the unset position transfers through the mating first tapered surfaces and first tapered portions and through the metal seal member to the elastomeric seal member to cause the elastomeric seal member to set between the inner and outer annular wellhead members before the energizing ring moves downward from the unset position into the slot; and

continuing downward force causes the energizing ring to enter the slot to a set position, which forces the inner and outer annular walls into sealing engagement with the inner and outer wellhead members.

10. The assembly according to claim 9, further comprising:

a second tapered portion extending upward from the first tapered portion of each of the upward facing shoulders, each of the second tapered portions being a straight frusto-conical surface at a lesser angle relative to the axis than the first angle.

11. The assembly according to claim 10, wherein the angle of each of the second tapered portions is greater than the second angle of each of the second tapered surfaces of the energizing ring.

12. The assembly according to claim 9, wherein the inner and outer annular walls within the slot deform to define a tapered portion that matches the second tapered surface when the energizing ring is in the set position.

13. A method for sealing an annular space between inner and outer wellhead members of a wellhead assembly, the annular space having a landing shoulder, the method comprising:

providing a metal seal member having inner and outer annular walls defining a slot therebetween and an upward facing shoulder at an upper end of the slot having a first tapered portion that is a straight frusto-conical surface at a first angle relative to an axis of the seal member, an annular energizing ring having a lower end with a first tapered surface that is a straight frusto-conical surface at the same first angle, and a second tapered surface at a second angle relative to the axis that is less than the first angle;

securing an elastomeric seal member on a lower end of the metal seal member to define a seal assembly and placing the energizing ring in an unset position with the first tapered surface of the energizing ring in flush, mating contact with the first tapered portion of the upward facing shoulder;

inserting the seal assembly into the annular space and landing the elastomeric seal member on the landing shoulder;

applying a downward force on the energizing ring to cause the elastomeric seal member to seal between the inner and outer wellhead members while the energizing ring remains in the unset position; then

inserting the energizing ring into the slot by increasing the downward force on the energizing ring, causing the second tapered surface to enter the slot and force the inner and outer walls into sealing engagement with the inner and outer wellhead members.

14. The method according to claim 13, further comprising providing the upward facing shoulder with a second tapered portion extending upward from the first tapered portion at a lesser angle relative to the axis than the first angle.

15. The method according to claim 14, wherein the angle of the second tapered portion is greater than the second angle of the second tapered surface of the energizing ring relative to the axis.

16. The method according to claim 13, wherein the step of providing the energizing ring with first and second tapered surfaces comprises forming the first and second tapered surfaces on both inner and outer sides of the energizing ring.