

CLAIMS

What is claimed is.

1. A seal assembly 22 for use with a casing hanger 24 comprising:

an upper ring 28;

a lower compressible ring 32 coaxially disposed with the upper ring 28;

a bore 46 axially extending through the upper ring 28 and compressible ring 32;

an elongated fastener 38 inserted in the bore 46; and

characterized by,

an annular support grommet 50 on a surface of the compressible ring 32 that comprises an aperture registered with the bore 46 and a protrusion projecting into the compressible ring 32, so that when the fastener 38 is torqued to axially compress the lower compressible ring 32, a sealing interface is formed between the support grommet 50 and the lower compressible ring 32.
2. The seal assembly 22 of claim 1, characterized in that the upper ring 28 comprises metal and the lower compressible ring 32 comprises an elastomer.
3. The seal assembly 22 of claims 1 or 2, characterized in that the upper ring 28 and lower compressible ring 32 each comprise semi-circular portions that join along respective diagonal interfaces 30, 36.

4. The seal assembly 22 of any of claims 1-3, characterized in that the annular support grommet 50 changes from a substantially circular shape to an oval shape when the fastener 38 is torqued.
5. The seal assembly 22 of any of claims 1-4, further characterized by an O-ring 56 in sealing contact between the fastener 38 and inner surface of the support grommet 50.
6. The seal assembly 22 of claim 5, characterized in that the annular support grommet 50 comprises a first support grommet 50, the seal assembly 22 further comprising a second support grommet 50 on a side of the lower compressible ring 32 opposite the first grommet and an O-ring 56 between an inner surface of the second support grommet 50 and the fastener 38.
7. The seal assembly 22 of claim 6, characterized in that the fastener 38 comprises threads 40 on a lower end, and wherein each of the O-rings 56 has an inner diameter that is greater than an outer diameter of the threads on the lower end of the fastener 38.
8. The seal assembly 22 of claim 7, characterized in that the lower end of the fastener 38 attaches to a hanger body disposed on a lower end of the lower compressible ring 32.
9. The seal assembly 22 of any of claims 1-8, further characterized by a nut 42 threadingly engaged on an upper end of the fastener 38, an annular expansion ring 60 compressed between the nut and the upper ring 28, wherein axially spaced apart slots 62 are provided along a portion of a circumference of the annular expansion ring 60 that extend radially through the annular expansion ring 60.
10. A method of sealing between a wellhead housing 14 and a casing 21 comprising:

positioning an upper seal ring having axial bores 46 onto a lower seal ring 48 having axial bores 46;

registering the axial bores 46 on the upper seal ring 28 with the axial bores 46 on the lower seal ring 48;

characterized by,

providing annular grommets 50 each having an axial aperture and a ridge 52 circumscribing the aperture;

positioning the annular grommets 50 substantially coaxial with the axial bores 46 on the lower seal ring 48 and so that the ridges 52 contact the lower seal ring 48; and

using a threaded fastener 38 to couple together the upper and lower seal rings 48 to define a seal assembly 22 and so that the ridges protrude into the lower seal ring 48 and form a sealing interface between each of the annular grommets 50 and the lower seal ring 48.

11. The method of claim 10, characterized in that the threaded fastener 38 comprises an elongate member having threads 40 on an upper and a lower end.

12. The method of claim 11, further characterized by threadingly engaging a nut 42 with an upper end of the threaded fastener 38 and threading the lower end of the threaded fastener 38 into a hanger body, wherein tightening the nut 42 compresses the lower seal ring 48.

13. The method of claim 12, further characterized by providing Belleville washers 44 on the fasteners 38 between the nuts 42 and upper ring 28.

14. The method of any of claims 10-13, further characterized by using O-rings 56 to seal between the threaded fasteners 38 and the grommets 50.

CLAIMS

1. A seal assembly for use with a casing hanger comprising:
 - an upper ring;
 - a lower compressible ring coaxially disposed with the upper ring;
 - a bore axially extending through the upper ring and compressible ring;
 - an elongated fastener inserted in the bore having threads on a lower end;
 - first and second annular support grommets on opposing surfaces of the compressible ring, the first and second support grommets each comprising, an aperture registered with the bore and a protrusion projecting into the compressible ring, so that when the fastener is torqued to axially compress the lower compressible ring, a sealing interface is formed between the first and second support grommets and the lower compressible ring; and
 - O-rings in sealing contact between the fastener and inner surfaces of the first and second support grommets, and that each have an inner diameter greater than an outer diameter of the lower end of the elongated fastener.
2. The seal assembly of claim 1, wherein the upper ring comprises metal and the lower compressible ring comprises an elastomer.
3. The seal assembly of claim 1, wherein the upper ring and lower ring each comprise semi-circular portions that join along a diagonal interface.
4. The seal assembly of claim 1, wherein the annular support grommet changes from a substantially circular shape to an oval shape when the fastener is torqued.

5. The seal assembly of claim 1, wherein the lower end of the fastener attaches to a hanger body disposed on a lower end of the lower compressible ring.
6. The seal assembly of claim 1, further comprising a nut threadingly engaged on an upper end of the fastener, an annular expansion ring compressed between the nut and the upper ring, wherein axially spaced apart slots are provided along a portion of a circumference of the annular expansion ring that extend radially through the annular expansion ring.
7. The seal assembly of claim 1, wherein the elongated fastener threadingly engages an upper surface of the casing hanger.
8. A method of sealing between a wellhead housing and a casing comprising:
 - positioning an upper seal ring having axial bores onto a lower seal ring having axial bores;
 - registering the axial bores on the upper seal ring with the axial bores on the lower seal ring;
 - providing annular grommets each having an axial aperture and a ridge circumscribing the aperture;
 - positioning the annular grommets substantially coaxial with the axial bores on the lower seal ring and so that the ridges contact the lower seal ring; and
 - using a threaded fastener to couple together the upper and lower seal rings to define a seal assembly and so that the ridges protrude into the lower seal ring and form a sealing interface between each of the annular grommets and the lower seal ring, wherein the threaded fastener comprises an elongate member having threads on an

upper, and threads on a lower end that extend into a threaded bore on an upper surface of a casing hanger.

9. The method of claim 8, further comprising threadingly engaging a nut with an upper end of the threaded fastener and threading the lower end of the threaded fastener into a hanger body, wherein tightening the nut compresses the lower seal ring.

10. The method of claim 9, further comprising providing Belleville washers on the fasteners between the nuts and upper ring.

11. The method of claim 8, further comprising using O-rings to seal between the threaded fasteners and the grommets.

12. A seal assembly for use with a casing hanger comprising:

an upper ring;

a lower compressible ring coaxially disposed with the upper ring;

a bore axially extending through the upper ring and compressible ring;

an elongated fastener inserted in the bore;

an annular support grommet on a surface of the compressible ring that comprises an aperture registered with the bore and a protrusion projecting into the compressible ring, so that when the fastener is torqued to axially compress the lower compressible ring, a sealing interface is formed between the support grommet and the lower compressible ring; and

a nut threadingly engaged on an upper end of the fastener, an annular expansion ring compressed between the nut and the upper ring, wherein axially spaced

apart slots are provided along a portion of a circumference of the annular expansion ring that extend radially through the annular expansion ring.