conventional, prior art, blowout preventers a) in a relaxed state and b) in a compressed state. When in the relaxed state, the sealing element 10' has a generally annular transverse cross-section. When the blowout preventer is closed, the sealing element 10' is compressed so as to reduce the diameter of the space it encloses. To do this, radially inwardly directed forces are applied to the sealing element 10', either directly or by virtue of the sealing element 10' being pushed against the BOP housing by a piston which is movable generally parallel to the longitudinal axis of the BOP.

The resulting deformation/folding pattern on the elastomeric material will be based on the least resistance region of the sealing element 10' and will depend on either the buckling modes of the elastomeric ring or the defects/weak regions of the elastomer. As a consequence, there is no control over the folding pattern at the inner surface of the sealing element 10' which will create irregular folds as shown in Figure 1b. Irregular folds creates high strains in certain folds and low strains in other folds, and the highly strained regions of the elastomeric material will have a tendency for faster crack growth/lesser life due to the availability of high strain energy density on the critical folding regions. Moreover, the sealing surface generated between the sealing element 10' and a tubular string 12' extending through the BOP will be perfect in some regions and not in other regions where the sealing element 10' is still spaced from the tubular string. This variation in the sealing surface means that a very high compressive force is required to seal completely around the tubular string.

Embodiments of the present invention seek to provide an improved pressure containment device in which these problems may be reduced.

According to one aspect of the invention we provide a pressure containment device comprising a sealing element having a longitudinal axis and a cross-section perpendicular to its longitudinal axis which is generally annular, the sealing element thus having a radially inwardly facing interior surface, a radially outwardly facing exterior surface, and a first end surface and a second

end surface which extend from the interior surface to the exterior surface, wherein both the interior surface and the first end surface are provided with a plurality of discrete recesses,

wherein the recesses provided in the interior surface form a first set of recesses in which the recesses are spaced around the circumference of the interior surface and the recesses in the first set are located exclusively in the interior surface between the first end surface and the second end surface;

wherein the recesses provided in the end surface form a second set of recesses in which the recesses are spaced in a generally circular array; and

wherein a centre of each of the recesses is located on an imaginary plane in which the longitudinal axis of the sealing element also lies, and the imaginary plane associated with each recess in the first set is located directly between two of the imaginary planes associated with the recesses of the second set.

The recesses in the first set may be located generally centrally between the first end surface and the second end surface. In one embodiment, the recesses in the first set are regularly spaced around the circumference of the interior surface.

In one embodiment, the recesses in the second set are regularly spaced in a generally circular array.

In one embodiment, a centre of each of the recesses is located on an imaginary plane in which the longitudinal axis of the sealing element also lies, and the imaginary plane associated with each recess in the second set is located directly between two of the imaginary planes associated with recesses of the first set.

The imaginary plane associated with each recess in the second set may be located centrally between two of the imaginary planes associated with recesses of the first set.

CLAIMS

1 A pressure containment device comprising a sealing element having a longitudinal axis and a cross-section perpendicular to its longitudinal axis which is generally annular, the sealing element thus having a radially inwardly facing interior surface, a radially outwardly facing exterior surface, and a first end surface and a second end surface which extend from the interior surface to the exterior surface at opposite ends of the sealing element, wherein both the interior surface and the first end surface are provided with a plurality of discrete recesses,

wherein the recesses provided in the interior surface form a first set of recesses in which the recesses are spaced around the circumference of the interior surface and the recesses in the first set are located exclusively in the interior surface between the first end surface and the second end surface;

wherein the recesses provided in the end surface form a second set of recesses in which the recesses are spaced in a generally circular array; and

wherein a centre of each of the recesses is located on an imaginary plane in which the longitudinal axis of the sealing element also lies, and the imaginary plane associated with each recess in the first set is located directly between two of the imaginary planes associated with the recesses of the second set.

2. A pressure containment device according to claim 1 wherein the recesses in the first set are located generally centrally between the first end surface and the second end surface.

3. A pressure containment device according to any preceding claim wherein the recesses in the first set are regularly spaced around the circumference of the interior surface.

4. A pressure containment device according to any preceding claim wherein the recesses in the second set are regularly spaced in a generally circular array.

5. A pressure containment device according to any preceding claim wherein a centre of each of the recesses is located on an imaginary plane in which the longitudinal axis of the sealing element also lies, and the imaginary plane associated with each recess in the second set is located directly between two of the imaginary planes associated with recesses of the first set.

6. A pressure containment device according to claim 5 wherein the imaginary plane associated with each recess in the second set is located centrally between two of the imaginary planes associated with recesses of the first set.

7. A pressure containment device according to any preceding claim wherein the imaginary plane associated with each recess in the first set is located centrally between two of the imaginary planes associated with the recesses of the second set.

8. A pressure containment device according to any preceding claim wherein the angle between adjacent imaginary planes is substantially equal for all pairs of adjacent imaginary planes.

9. A pressure containment device according to any preceding claim further comprising an actuator assembly which is operable to engage with the sealing element to reduce the diameter of the space enclosed by the interior surface.

10. A pressure containment device according to claim 9 further including a housing, the actuator assembly being operable to push the sealing element against the housing to reduce the diameter of the space enclosed by the interior surface.

11. A pressure containment device according to claim 9 or 10 wherein the actuator assembly comprises a piston movable by means of the supply of pressurised fluid to the pressure containment device.

12. A pressure containment device according to claim 11 wherein the piston is movable generally parallel to a longitudinal axis of the pressure containment device by means of the supply of pressurised fluid to the pressure containment device.

13. A pressure containment device according to any preceding claim wherein the sealing element is made predominantly from an elastomer.

14. A pressure containment device according to any preceding claim wherein the sealing element includes a plurality of rigid inserts.

15. A pressure containment device according to claim 14 wherein the inserts are spaced from one another and arranged in a generally circular array around the space enclosed by the interior surface of the sealing element.