

CLAIMS

1. A system for forming a seal between wellbore components, comprising:
an annular seal arranged between a first wellbore component and a second wellbore component, the seal comprising a first leg and a second leg, the first leg positioned proximate the
5 first wellbore component and the second leg positioned proximate the second wellbore component, wherein upon activation of the seal, the first leg engages the first wellbore component and the second leg engages the second wellbore component; and
an energizing ring adapted to activate the seal, the energizing ring extending into an opening of the seal to drive the first leg and the second leg radially outward relative to an axis of
10 the seal,
wherein the first wellbore component includes a groove profile, the groove profile having a plurality of grooves including respective first surfaces and second surfaces, the respective first surfaces arranged at respective first angles and the respective second surface arranged at
respective second angles, the respective first and second angles being different to form respective
15 asymmetrical grooves.
2. The system of claim 1, wherein at least one of the respective first angles and second angles are acute.
- 20 3. The system of claim 1, wherein the first angle is greater than the second angle, the first angle directing at least a portion of a force applied by the first leg in a radial direction.

4. The system of claim 1, wherein the first leg includes a second groove profile, the second groove profile having a plurality of bumps including respective first bump surfaces and second bump surfaces, the first bump surface arranged at a first bump angle and the second bump surface arranged at a second angle, the first bump angle and the second bump angle being different.

5. The system of claim 4, wherein the respective first bump surfaces are substantially arcuate and the second bump surfaces are substantially flat.

6. The system of claim 4, wherein the grooves of the plurality of grooves are grouped into groove groups and bumps of the plurality of bumps are grouped into bump groups, the respective groove groups and bump groups being separated from adjacent groove groups and bump groups.

7. The system of claim 1, wherein the first angle is less than the second angle.

8. The system of claim 1, wherein at least a portion of the respective first groove surfaces are engaged when the seal is subjected to a downhole force, the respective first groove surfaces translated at least a portion of the upstream force into a radial force.

9. The system of claim 8, wherein a contact force between the seal and the first wellbore component increases when the downhole force acts on the seal.

10. A downhole sealing system, comprising:

a U-shaped seal having a first leg and a second leg, the first leg being a hanger side leg having a hanger side profile, comprising:

a bump formed by at least a portion of a peak positioned proximate a pair of
5 troughs, the bump having a first bump surface and a second bump surface, the first bump surface arranged in an uphole direction and the second bump surface arranged in a downhole direction;
and

a hanger adapted to be positioned proximate the first leg of the U-shaped seal, the hanger having a hanger profile, comprising:

10 a groove having a first groove surface and a second groove surface, the first groove surface arranged at a first angle in the downhole direction and the second groove surface arranged at a second angle in the upstream direction, the first and second angles being different to form an asymmetrical groove.

15 11. The downhole sealing system of claim 10, further comprising:

a plurality of bumps forming the hanger side profile; and

a plurality of grooves forming the hanger profile;

wherein respective bumps of the plurality of bumps are positioned to engage respective
grooves of the plurality of grooves when the first leg is driven toward the hanger.

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12. The downhole sealing system of claim 10, wherein at least one of the respective first angles and second angles are acute.

13. The downhole sealing system of claim 10, wherein the first angle is greater than the second angle, the first angle directing at least a portion of a force applied by the first leg in a radial direction.

5 14. The downhole sealing system of claim 10, wherein the first bump surface is arranged at a first bump angle and the second bump surface is arranged the at a second bump angle, the first and second bump angles being different.

10 15. The downhole sealing system of claim 10, wherein the first bump surface is substantially arcuate and the second bump surface is substantially flat.

16. The downhole sealing system of claim 10, wherein the first groove surface is engaged, by the first bump surface, the when the seal is subjected to a downhole force.

15 17. The downhole sealing system of claim 11, wherein the first groove surface is engaged, by the first bump surface, and the second groove surface is engaged, by the second bump surface, the when the seal is subjected to an uphole force.

18. A method for forming a downhole seal, comprising:
20 arranging a seal within a wellbore between a first wellbore component and a second wellbore component;
aligning an energizing ring with an opening of the seal;

driving the energizing ring into the opening of the seal to deform the seal, the deformation driving a first leg of the seal toward the first wellbore component and a second leg of the seal toward the second wellbore component; and

engaging an asymmetrical groove formed in the first wellbore component via a profile of
5 the first leg.

19. The method of claim 18, further comprising:

engaging a first surface of the asymmetrical groove via a first profile surface of the first leg when the seal is subject to a downhole force.

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20. The method of claim 18, further comprising:

engaging a first surface of the asymmetrical groove via a first profile surface of the first leg when the seal is subject to an uphole force; and

engaging a second surface of the asymmetrical groove via a second profile surface of the
15 first leg when the seal is subject to the uphole force.