(57) Abstract: A seal protection arrangement including a seal. One or more projections disposed proximate the seal and having rigidity/ flexibility to deflect components passing thereby that are not intended to seal with the seal. Rigidity/flexibility to allow a component intended to seal with the seal to engage and seal therewith. A method for protecting a seal in a downhole assembly.

Declarations under Rule 4.17:

— as to applicant’s entitlement to apply for and be granted a patent (Rule 4.17(ii))
— as to the applicant’s entitlement to claim the priority of the earlier application (Rule 4.17(iii))

Published:

— with international search report (Art. 21(3))
DOWNHOLE SEAL PROTECTOR ARRANGEMENT

CROSS REFERENCE TO RELATED APPLICATIONS

[0001] This application claims the benefit of U.S. Application No. 14/286158, filed on May 23, 2014, which is incorporated herein by reference in its entirety.

BACKGROUND

[0002] Seals are ubiquitous in the downhole environment for many purposes. Types of seals of course range in material, size construction, etc. but in all cases the purpose is to support a differential pressure across the seal. For this reason, it is important to maintain a sealing surface of the seal in an as built condition. More specifically, it is important to avoid significant scratches or other damage that could potentially create a leak path. Damage to the seals can relatively easily occur due to running well equipment past the seal during initial completion of the well of in remediatory activities thereafter. Each item run into the well that can physically reach a surface of a seal is a potential antagonist. One commonly run component that is capable of causing some damage to the seals of the well is a collet. As one of skill in the art recognizes, collets are often run and often more than one will be part of a single run into the borehole. This means that the seals must endure several assaults on their integrity in a single run. While present construction has somewhat alleviated the problem with careful planning and seal materials, the art is always receptive to innovations that increase productivity and reduce complexity and cost.

SUMMARY

[0003] A seal protection arrangement including a seal; and one or more projections disposed proximate the seal and having rigidity/flexibility to deflect components passing thereby that are not intended to seal with the seal and rigidity/flexibility to allow a component intended to seal with the seal to engage and seal therewith.

[0004] A method for protecting a seal in a downhole assembly including disposing one or more projections proximate the seal, the one or more projections having rigidity/flexibility to deflect components passing thereby that are not intended to seal with the seal and rigidity/flexibility to allow a component intended to seal with the seal to engage and seal therewith; running downhole equipment over the projections while not contacting the seal.
[0005] A downhole system including a housing; a seal disposed in the housing; and one or more projections disposed proximate the seal, the projections having rigidity/flexibility to deflect components passing thereby that are not intended to seal with the seal and rigidity/flexibility to allow a component intended to seal with the seal to engage and seal therewith.

BRIEF DESCRIPTION OF THE DRAWINGS

[0006] Figure 1 is a cross sectional view of one embodiment of the invention;
[0007] Figure 2 is the cross section of Figure 1 with a collet represented passing the seal;
[0008] Figure 3 is the cross section of Figure 1 with the component sealing with the seal; and
[0009] Figure 4 is a cross sectional view of another embodiment of the invention.

DETAILED DESCRIPTION

[0010] Referring to Figure 1, a seal protection arrangement 8 comprises a seal 10 centrally illustrated with one or more projections 12 positioned on one or more longitudinal ends of the seal 10. In the case of Figure 1, the projections are one or more fingers. The fingers may be constructed of a number of different materials including metal, controlled electrolytic metal material, polymeric, rubber, Poly ether ether Ketone (PEEK), Polytetrafluoroethylene (PTFE), a composite material having a more rigid core and a softer surface, etc. depending upon rigidity and flexibility required for a particular application. Also note that for the controlled electrolytic material example, the projections could be nonflexible but corrode away at a selected time to allow for sealing while prior to the selected time protecting the seal. Importantly in most embodiments, the rigidity/flexibility of the material is to be selected to both cause a deformation of one or more collets passing radially inwardly of the seal during run in or run out while allowing a component (not shown this Figure; see Figure 3) intended to seal against the seal 10 to deflect the one or more fingers and come in sealing contact with the seal 10. In other words the rigidity/flexibility of the one or more fingers 12 must be between the rigidity/flexibility of the collets (or other components) being run through the relevant section of the borehole and the rigidity/flexibility of the component intended to seal against seal 10. The component intended to seal against the seal 10 is, in at least one embodiment, a quite rigid construction such as a slick joint. Accordingly, the range of rigidity/flexibility of the one or more fingers is relatively
large providing that the endpoints of the range facilitate desired function of keeping passing components off the seal 10 and allowing the component intended to seal with the seal 10 to engage the seal 10 and effect the intended seal.

[0011] In the embodiment illustrated in Figure 1, the one or more fingers are configured with a base 14 for affixation to a housing 16 in which the seal 10 is mounted. Further the one or more fingers exhibit a curved section 18 extending from the base 14 in a radially inward direction from the housing. The curved section, as can be appreciated from the illustration extends further radially inwardly than a surface 20 of the seal 10, itself mounted to the housing to support functionality as discussed. Because in this embodiment the one or more fingers are curved however, they also facilitate the one or more fingers moving out of the way when seal contact is appropriate. In action, see Figure 2, prior to sealing, the one or more fingers 12 will cause the deflection of collets 22 moving therepast such that the collets do not contact seal surface 20 as they pass. It will also be appreciated that other well components will be deflected as well. This ensures that no damage can be inflicted on the seal surface 20 during well operations prior to and subsequent to engagement of the seal with the component intended to actually make that engagement. While only one collet finger and two of the one or more fingers are illustrated, it will be appreciated that more may be located about a circumferential completeness of the housing, the Figure only being a cross sectional view. Moreover, it is to be appreciated that the housing is contemplated to be a part of a borehole string (drilling, completion, injection, etc.) and that any number of collets (or other components) may be moved past the arrangement. Referring to Figure 3, the component 24 intended to seal against seal 10 will flatten the curved sections 18 against the housing 16 leaving the seal surface 20 proud of the deflected one or more fingers to facilitate sealing as illustrated.

[0012] In another embodiment, referring to Figure 4, the one or more projections are configured as one or more wipers 30 (note that combinations of fingers and wipers in any arrangement longitudinally or circumferentially is also contemplated). The wipers 30 may be configured as fully annularly complete or as pieces with the ultimate degree of wiping capability being variable between a maximal wiping when configured as a full ring and lessening wiping action with increasing gap size between annularly grouped individual pieces. Wipers can be beneficial in reducing the amount of proppant or sand that might accumulate under the seal during downhole operations. The one or more wipers comprise the materials listed in connection with figure 1 or materials that support the goals set forth above with regard to Figure 1 in that the rigidity/flexibility of the one or more wipers 30 must be
between the rigidity/flexibility of the collets (or other components) being run through the relevant section of the borehole and the rigidity/flexibility of the component intended to seal against seal 10. The one or more wipers 30 will resiliently deform to allow sealing.

[0013] It is further to be understood that the one or more projections (fingers or wipers) may be configured to form an additional seal against the component intended to seal against the seal 10 in certain embodiments. In other embodiments, the one or more projections may act as a backup seal or near seal against the same component to enhance the functionality of the seal 10.

[0014] While the invention has been described with reference to an exemplary embodiment or embodiments, it will be understood by those skilled in the art that various changes may be made and equivalents may be substituted for elements thereof without departing from the scope of the invention. In addition, many modifications may be made to adapt a particular situation or material to the teachings of the invention without departing from the essential scope thereof. Therefore, it is intended that the invention not be limited to the particular embodiment disclosed as the best mode contemplated for carrying out this invention, but that the invention will include all embodiments falling within the scope of the claims. Also, in the drawings and the description, there have been disclosed exemplary embodiments of the invention and, although specific terms may have been employed, they are unless otherwise stated used in a generic and descriptive sense only and not for purposes of limitation, the scope of the invention therefore not being so limited. Moreover, the use of the terms first, second, etc. do not denote any order or importance, but rather the terms first, second, etc. are used to distinguish one element from another. Furthermore, the use of the terms a, an, etc. do not denote a limitation of quantity, but rather denote the presence of at least one of the referenced item.
CLAIMS
What is claimed:

1. A seal protection arrangement (8) characterized by:
   a seal (10); and
   one or more projections (12) disposed proximate the seal (10) and having
   rigidity/flexibility to deflect components (24) passing thereby that are not intended to seal
   (10) with the seal (10) and rigidity/flexibility to allow a component (24) intended to seal (10)
   with the seal (10) to engage and seal (10) therewith.

2. A seal protection arrangement (8) as claimed in claim 1 wherein the one or
   more projections (12) are fingers.

3. A seal protection arrangement (8) as claimed in claim 1 wherein the one or
   more fingers are curved away from the seal (10).

4. A seal protection arrangement (8) as claimed in claim 1 wherein the one or
   more projections (12) are metal.

5. A seal protection arrangement (8) as claimed in claim 1 wherein the one or
   more projections (12) are rubber.

6. A seal protection arrangement (8) as claimed in claim 1 wherein the one or
   more projections (12) comprise a composite material.

7. A seal protection arrangement (8) as claimed in claim 1 wherein the one or
   more projections (12) are wipers (30).

8. A seal protection arrangement (8) as claimed in claim 1 wherein the one or
   more projections (12) are a controlled electrolytic material.

9. A seal arrangement (8) as claimed in claim 1 wherein the one or more
   projections (12) act as a seal (10) or a backup seal (10) for the component (24) and the
   seal(10).

10. A method for protecting a seal (10) in a downhole assembly characterized by:
    disposing one or more projections (12) proximate the seal (10), the one or more
    projections (12) having rigidity/flexibility to deflect components (24) passing thereby that are
    not intended to seal (10) with the seal (10) and rigidity/flexibility to allow a component (24)
    intended to seal (10) with the seal (10) to engage and seal (10) therewith;
    running downhole equipment over the projections (12) while not contacting the seal
    (10).

11. The method as claimed in claim 10 further including engaging a component
    (24) intended to seal (10) with the seal (10) and creating a seal (10).
A downhole system characterized by:

- a housing;
- a seal (10) disposed in the housing; and
- one or more projections (12) disposed proximate the seal (10), the projections (12) having rigidity/flexibility to deflect components (24) passing thereby that are not intended to seal (10) with the seal (10) and rigidity/flexibility to allow a component (24) intended to seal (10) with the seal (10) to engage and seal (10) therewith.
A. CLASSIFICATION OF SUBJECT MATTER
F16J 15/02(2006.01)i, E21B 17/00(2006.01)i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED
Minimum documentation searched (classification system followed by classification symbols)
F16J 15/02; E02D 5/52; F16J 15/40; B65D 51/00; E21B 33/12; B23P 11/00; B23P 11/02; E21B 33/13; F16J 9/00; E21B 17/00

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
Korean utility models and applications for utility models
Japanese utility models and applications for utility models

Electronic data base consulted during the international search (name of database and, where practiceable, search terms used)
eKOMPASS(KIPO internal) & keywords: seal, projection, rigidity, flexibility, finger, wiper, and housing

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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<td>US 4041718 A (STONE, WILLIAM BUNDY) 16 August 1977 See abstract, column 2, lines 27-67, column 4, line 49 - column 5, line 9, and figures 3-4, 8-9.</td>
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Further documents are listed in the continuation of Box C.

See patent family annex.

* Special categories of cited documents:
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