

LANDING SYSTEM

BACKGROUND

[0001] This section is intended to introduce the reader to various aspects of art that may be related to various aspects of the present invention, which are described and/or claimed below. This discussion is believed to be helpful in providing the reader with background information to facilitate a better understanding of the various aspects of the present invention. Accordingly, it should be understood that these statements are to be read in this light, and not as admissions of prior art.

[0002] In some drilling and production systems, hangers, such as a tubing hanger, may be used to suspend strings of tubing for various flows in and out of a well. Such hangers may be disposed within a wellhead that supports both the hanger and the string. For example, a tubing hanger may be lowered into a wellhead and supported therein. To facilitate the running or lowering process, the tubing hanger may couple to a tubing hanger running tool (THRT). Once the tubing hanger has been lowered into a landed position within the wellhead by the THRT, the tubing hanger may then be locked into position. The THRT may then be disconnected from the tubing hanger and extracted from the wellhead. Unfortunately, wellheads components (e.g., spools) with preformed ledges or landings reduce the size of the bore, which requires either smaller drilling equipment or larger more expensive wellheads with larger bores.

SUMMARY

[0002A] According to a first aspect, there is provided a system including a landing system. The landing system includes:

a landing member configured to move between an extended position and a retracted position relative to a wall surrounding an axial bore of a mineral extraction system component;

a shaft configured to move within a radial bore in the wall surrounding the axial bore to drive the landing member in a first radial direction and a second radial direction;

an actuation system configured to move the shaft in the first radial direction through the radial bore to move the landing member into the extended position within the axial bore, wherein the landing member is configured to support a component within the axial bore after lowering the component through the axial bore toward the landing member; and

a spring configured to drive the shaft in the second radial direction within the radial bore to retract the landing member.

[0002B] According to a second aspect, there is provided a system including:

a mineral extraction system comprising a spool comprising a wall surrounding an axial bore and a radial bore in the wall and fluidly coupled to the axial bore;

a landing system configured to support a component inside the axial bore, wherein the landing system comprises:

a landing member configured to move between an extended position and a retracted position relative to the wall surrounding the axial bore of the spool;

a shaft configured to move within the radial bore in the wall surrounding the axial bore to drive the landing member in a first radial direction and a second radial direction;

an actuation system configured to drive the shaft in the first radial direction through the radial bore to move the landing member into the extended position within the axial bore, wherein the landing member is configured to support the component within the axial bore after lowering the component through the axial bore toward the landing member; and

a spring configured to drive the shaft in the second radial direction within the radial bore to retract the landing member.

[0002C] According to a third aspect, there is provided a method comprising:

driving an actuation system in an axial direction with respect to an axial bore of a mineral extraction system, wherein driving the actuation system comprises axially driving a plate;

driving a shaft in a first radial direction through a radial bore in a wall surrounding the axial bore of the mineral extraction system with the actuation system;

driving a landing member in the first radial direction into the axial bore with the shaft; and

lowering a mineral extraction system component through the axial bore toward the landing member, wherein the landing member is configured to support the mineral extraction system component.

[0002D] According to a fourth aspect, there is provided a method comprising:

driving a shaft in a first radial direction through a radial bore in a wall surrounding an axial bore of a mineral extraction system with an actuation system;

driving a landing member in the first radial direction into the axial bore with the shaft;

lowering a mineral extraction system component through the axial bore toward the landing member, wherein the landing member is configured to support the mineral extraction system component; and

retracting the landing member by driving the shaft in a second radial direction with a spring.

BRIEF DESCRIPTION OF THE DRAWINGS

[0003] Various features, aspects, and advantages of the present invention will become better understood when the following detailed description is read with reference to the accompanying figures in which like characters represent like parts throughout the figures, wherein:

[0004] FIG. 1 is a block diagram of an embodiment of a mineral extraction system with a landing system;

CLAIMS

1. A system, comprising:
 - a landing system, comprising:
 - a landing member configured to move between an extended position and a retracted position relative to a wall surrounding an axial bore of a mineral extraction system component;
 - a shaft configured to move within a radial bore in the wall surrounding the axial bore to drive the landing member in a first radial direction and a second radial direction;
 - an actuation system configured to move the shaft in the first radial direction through the radial bore to move the landing member into the extended position within the axial bore, wherein the landing member is configured to support a component within the axial bore after lowering the component through the axial bore toward the landing member; and
 - a spring configured to drive the shaft in the second radial direction within the radial bore to retract the landing member.
2. The system of claim 1, wherein the landing member comprises a c-ring that rests within an annular groove on the mineral extraction system component.
3. The system of claim 1, wherein the shaft includes an annular groove that receives a seal, wherein the seal is configured to block the flow of fluid through the radial bore in the wall of the mineral extraction system component.
4. The system of claim 1, wherein the shaft comprises an annular lip that contacts the spring.
5. The system of claim 4, wherein the annular lip comprises a first retaining ring that couples to an annular groove on the shaft.

6. The system of claim 5, comprising an outer retaining ring with an aperture, wherein the outer retaining ring is configured to allow the shaft to move axially through the outer retaining ring while simultaneously blocking complete removal of the shaft from the radial bore in the wall of the mineral extraction system component.
7. The system of claim 1, wherein the actuation system comprises a plate with a first angled surface configured to contact a second angled surface on the shaft and to drive the shaft in the second radial direction within the radial bore in the wall of the mineral extraction system component.
8. The system of claim 7, wherein the actuation system comprises a mechanical actuation system.
9. The system of claim 7, wherein the actuation system comprises a hydraulic actuation system.
10. The system of claim 7, wherein the plate comprises an axial aperture configured to receive a bolt that couples the plate to the mineral extraction system component.
11. The system of claim 1, wherein the mineral extraction system component is a spool.
12. A system comprising,
 - a mineral extraction system, comprising:
 - a spool comprising a wall surrounding an axial bore and a radial bore in the wall and fluidly coupled to the axial bore;
 - a landing system configured to support a component inside the axial bore, wherein the landing system comprises:
 - a landing member configured to move between an extended position and a retracted position relative to the wall surrounding the axial bore of the spool;

a shaft configured to move within the radial bore in the wall surrounding the axial bore to drive the landing member in a first radial direction and a second radial direction;

an actuation system configured to drive the shaft in the first radial direction through the radial bore to move the landing member into the extended position within the axial bore, wherein the landing member is configured to support the component within the axial bore after lowering the component through the axial bore toward the landing member; and

a spring configured to drive the shaft in the second radial direction within the radial bore to retract the landing member.

13. The system of claim 12, wherein the component comprises a hanger.

14. The system of claim 12, wherein the landing member comprises a c-ring that rests within an annular groove on the spool.

15. The system of claim 12, wherein the shaft comprises an annular lip that contacts the spring.

16. The system of claim 15, wherein the annular lip comprises a first retaining ring that couples to an annular groove on the shaft.

17. The system of claim 16, comprising a second retaining ring with an aperture, wherein the second retaining ring is configured to allow the shaft to move axially through the second retaining ring while simultaneously blocking complete removal of the shaft from the radial bore in the spool.

18. A method, comprising:

driving an actuation system in an axial direction with respect to an axial bore of a mineral extraction system, wherein driving the actuation system comprises axially driving a plate;

driving a shaft in a first radial direction through a radial bore in a wall surrounding the axial bore of the mineral extraction system with the actuation system;

driving a landing member in the first radial direction into the axial bore with the shaft; and

lowering a mineral extraction system component through the axial bore toward the landing member, wherein the landing member is configured to support the mineral extraction system component.

19. The method of claim 18, comprises retracting the landing member by driving the shaft in a second radial direction with a spring.

20. A method, comprising:

driving a shaft in a first radial direction through a radial bore in a wall surrounding an axial bore of a mineral extraction system with an actuation system;

driving a landing member in the first radial direction into the axial bore with the shaft;

lowering a mineral extraction system component through the axial bore toward the landing member, wherein the landing member is configured to support the mineral extraction system component; and

retracting the landing member by driving the shaft in a second radial direction with a spring.