US 20240060380A1

(19) United States
(12) Patent Application Publication
STRANKMAN

(10) Pub. No.: US 2024/0060380 A1
(43) Pub. Date: Feb. 22, 2024

(54) **REMOTE ACTUATED ROTARY WELLHEAD CONNECTION**

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(21) Appl. No.: **18/235,260**

(22) Filed: **Aug. 17, 2023**

(30) **Foreign Application Priority Data**

Aug. 18, 2022 (CA) 3170855

Publication Classification

(51) **Int. Cl.**
E21B 33/03 (2006.01)

(52) **U.S. Cl.**
CPC *E21B 33/03* (2013.01)

(57) **ABSTRACT**

In one aspect there is provided a remote actuated rotary wellhead connection system for connecting pressure control equipment to a wellhead. The system comprises a flange assembly connectable to the wellhead, a crossover, a nut assembly to threadably secure the crossover to the flange assembly, and a nut assembly actuator to actuate the nut assembly between a threaded, connected state and an unthreaded, disconnected state. The crossover is connectable to the pressure control equipment, and the nut assembly actuator is remotely actuatable.

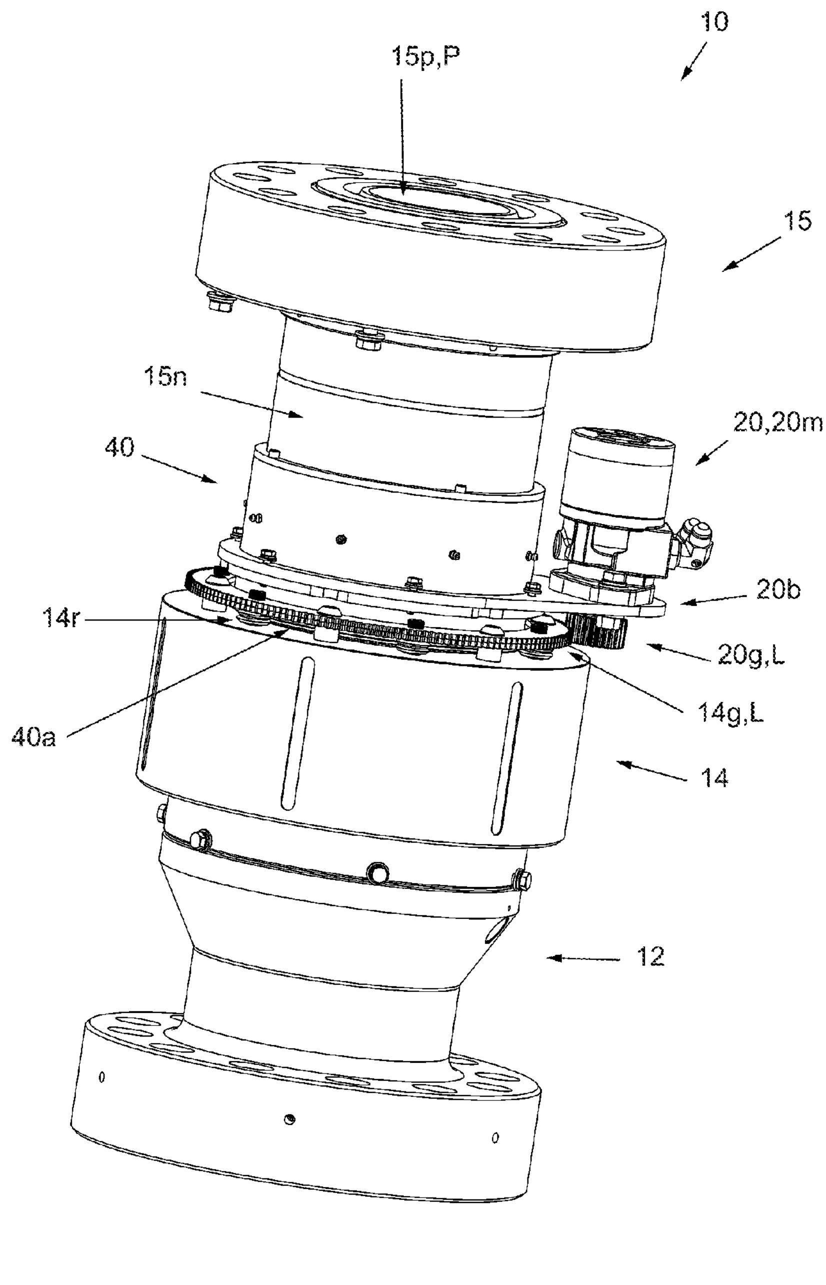


Fig. 1

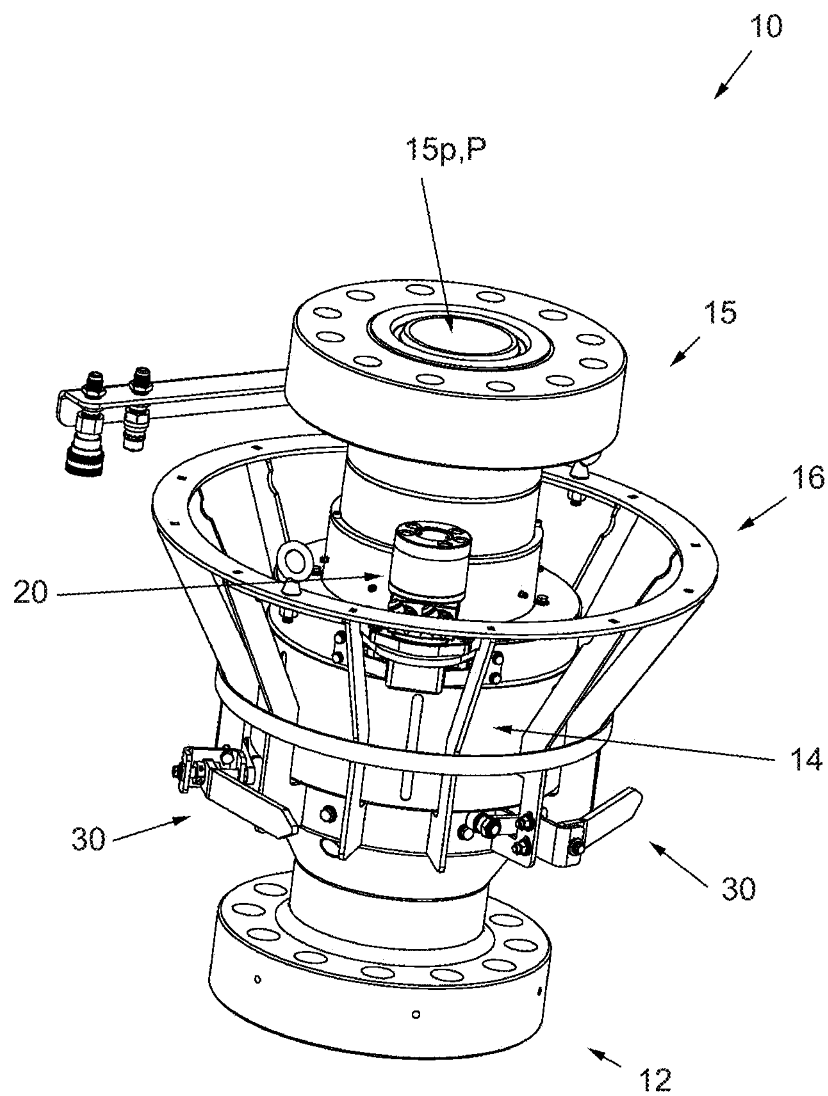


Fig. 2

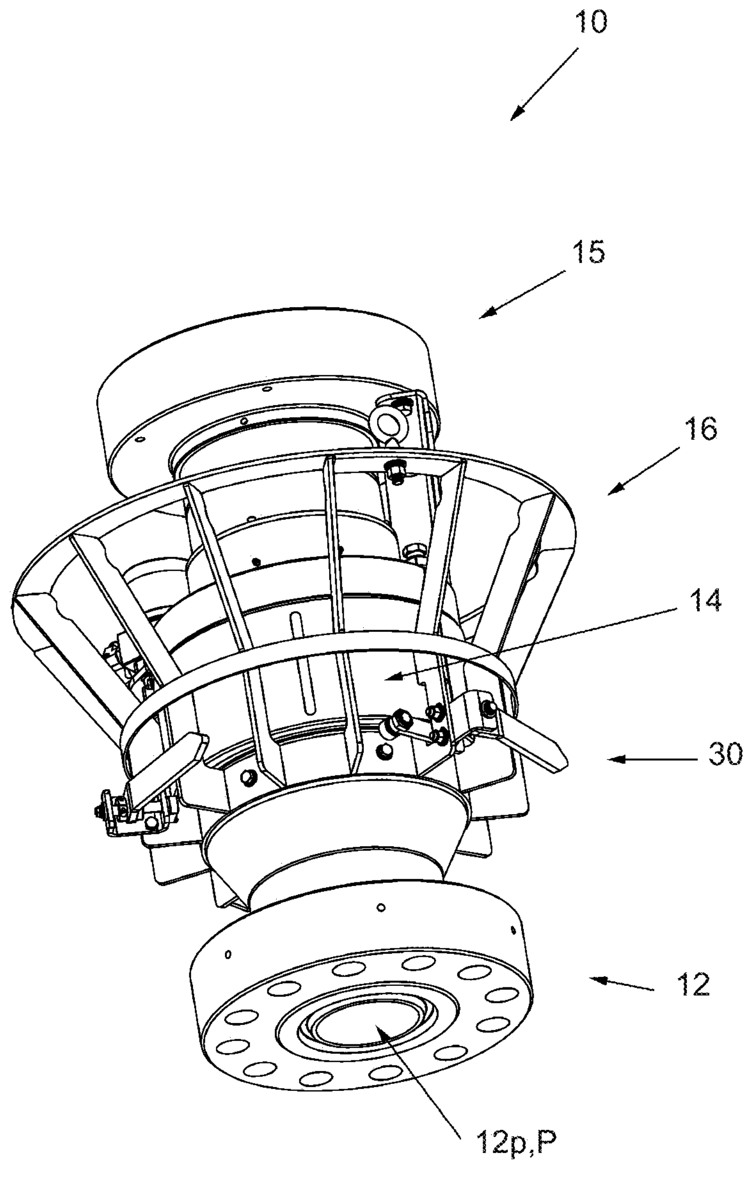


Fig. 3

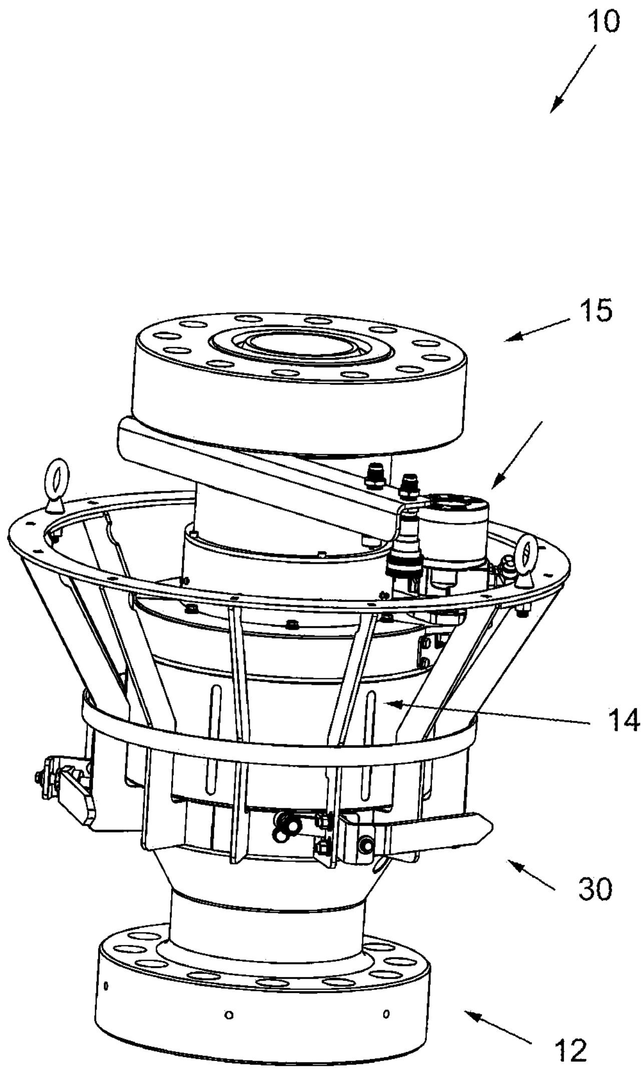


Fig. 4

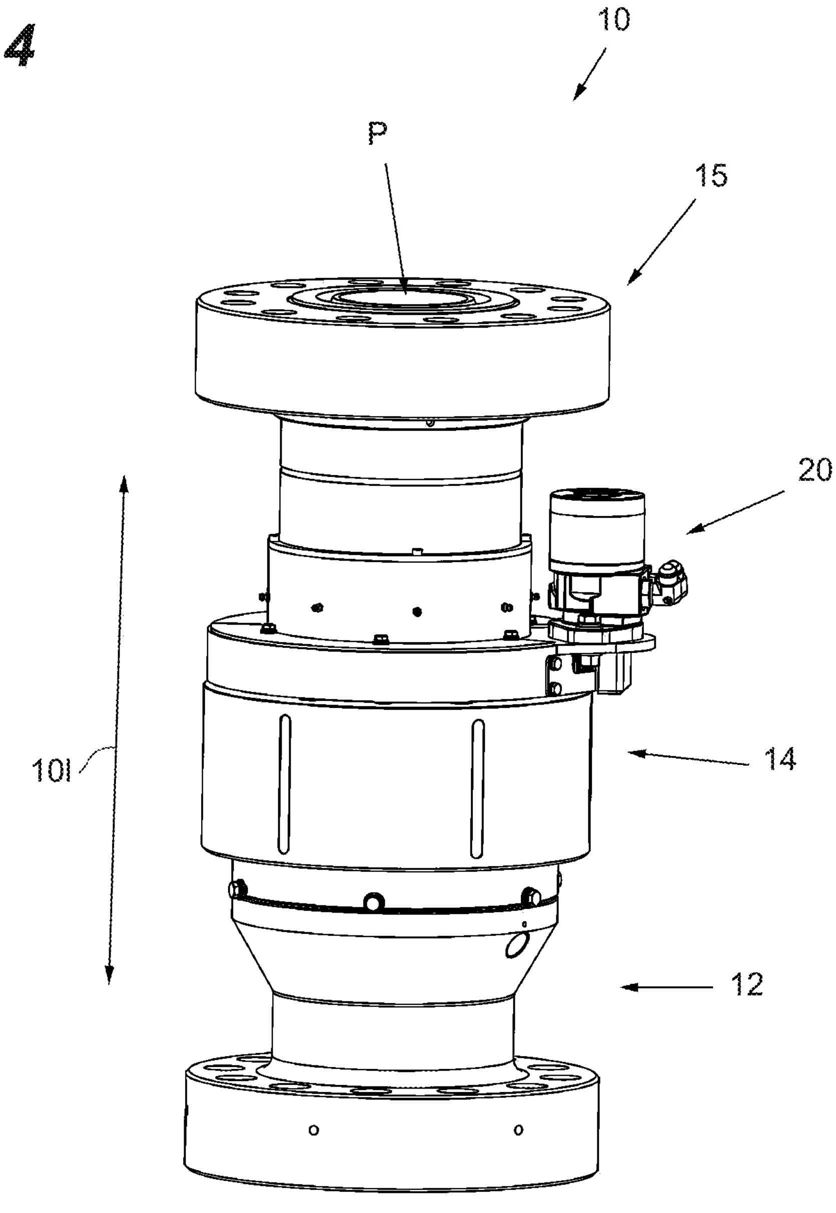


Fig. 5a

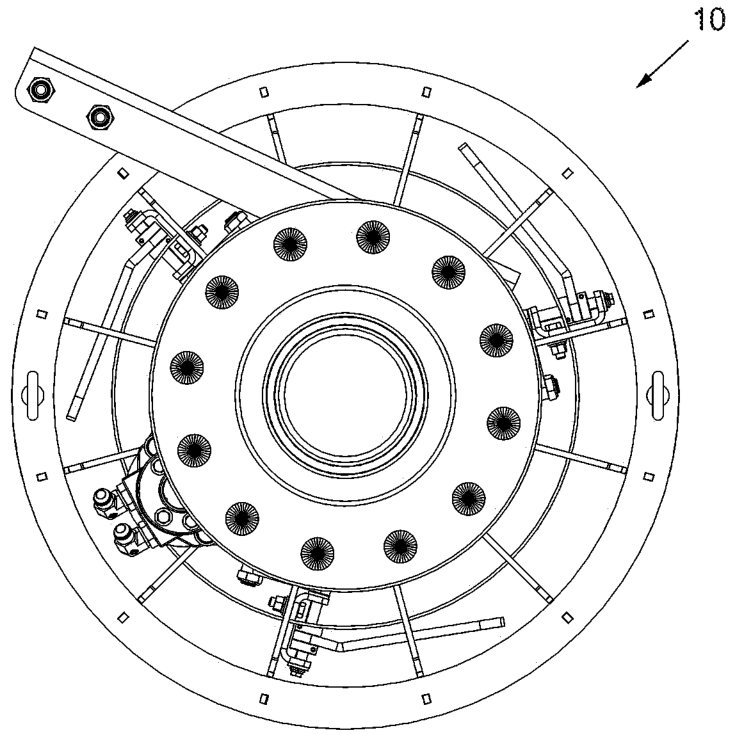


Fig. 5b

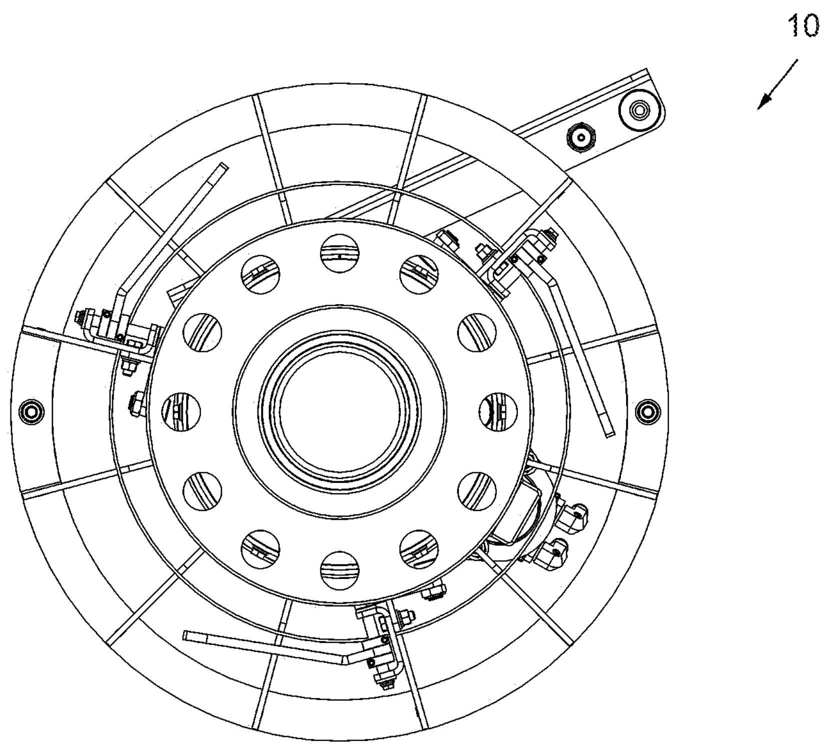


Fig. 6a

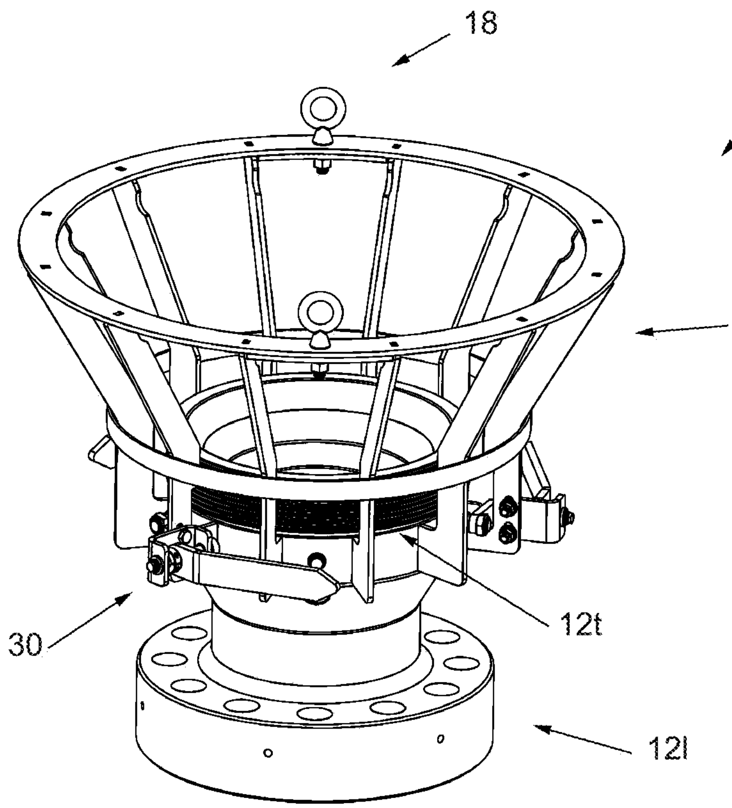

18
12
16
30
12t
12l

Fig. 6b

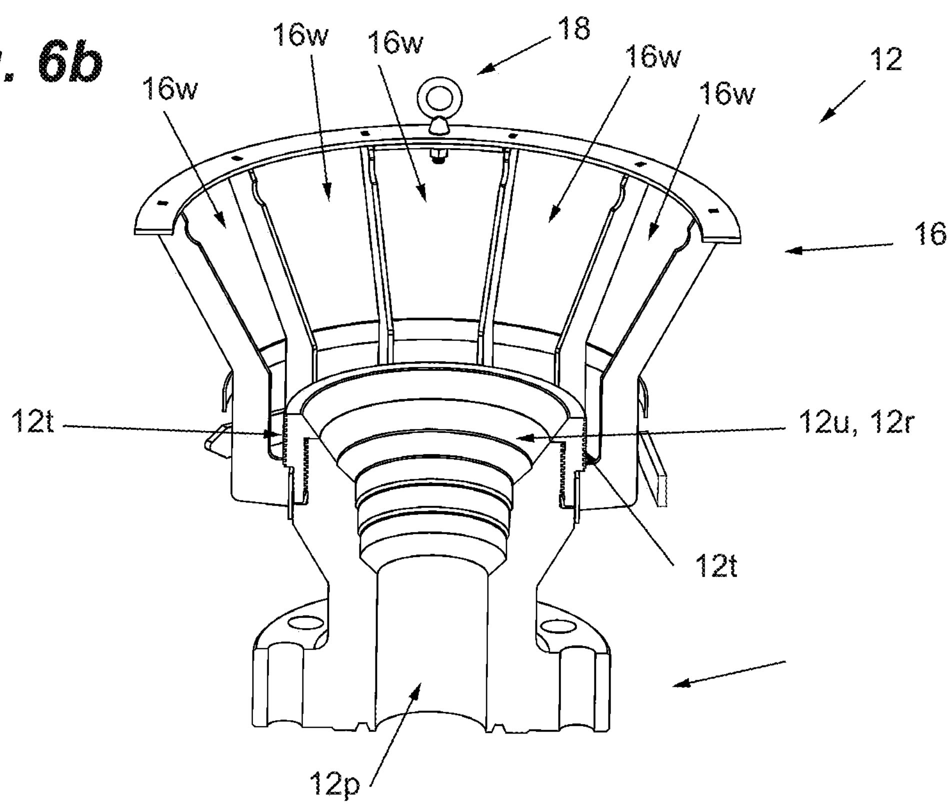

16w
16w
18
16w
12
16w
16w
16
12t
12u, 12r
12t
12p

Fig. 6c

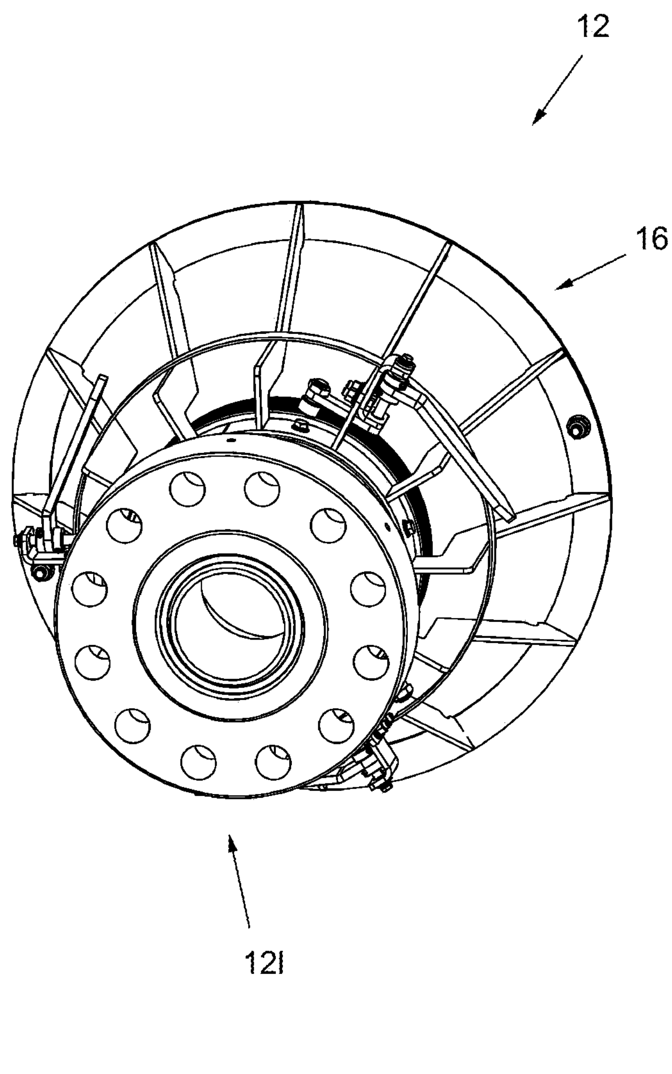


Fig. 6d

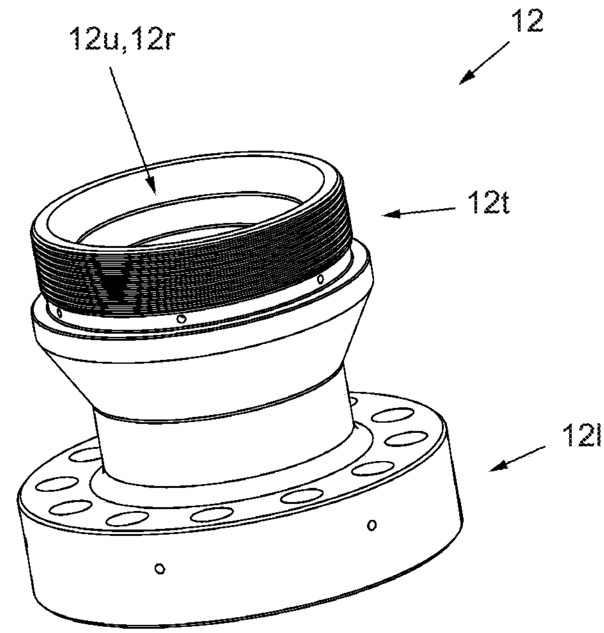


Fig. 6e

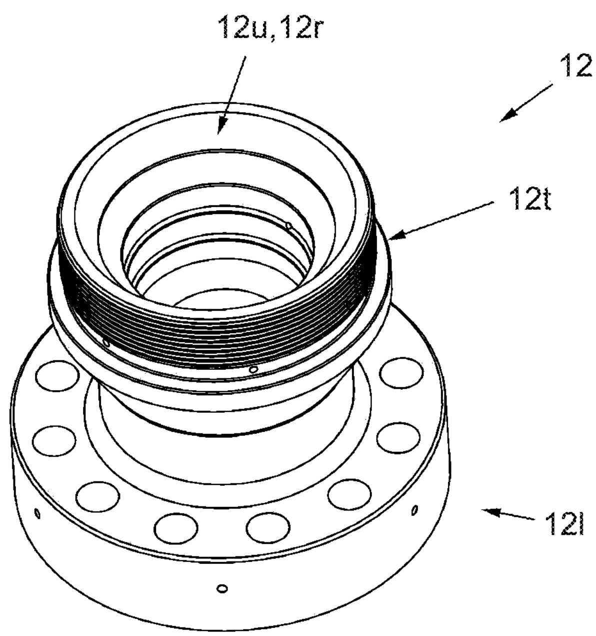


Fig. 7a

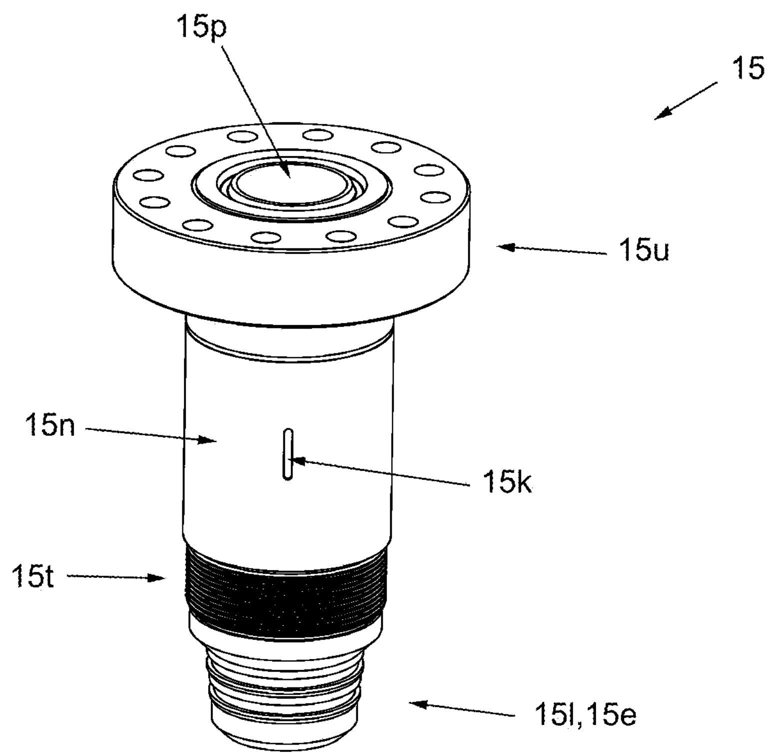


Fig. 7b

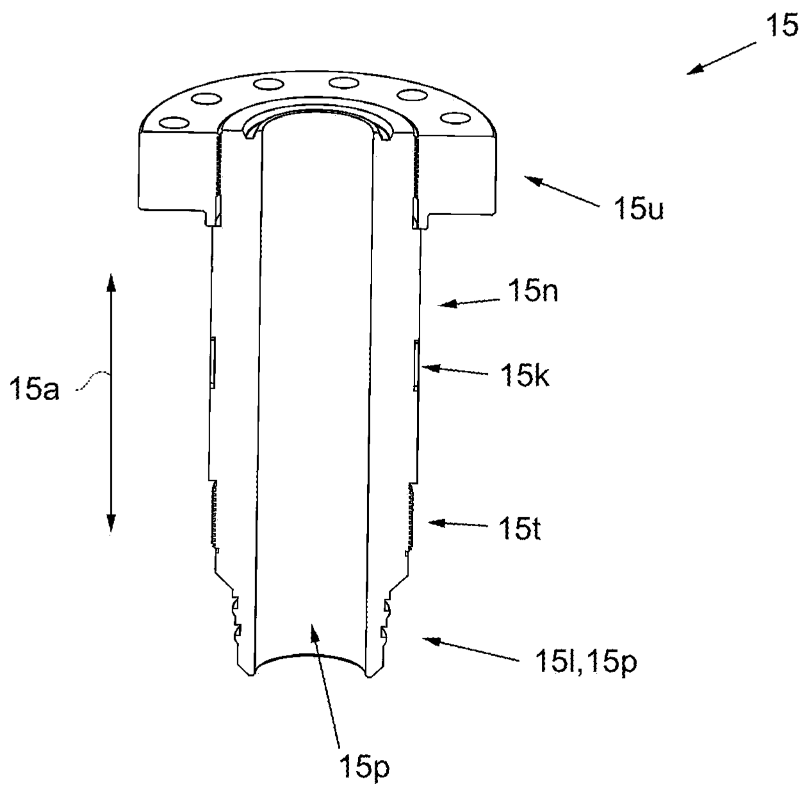


Fig. 7c

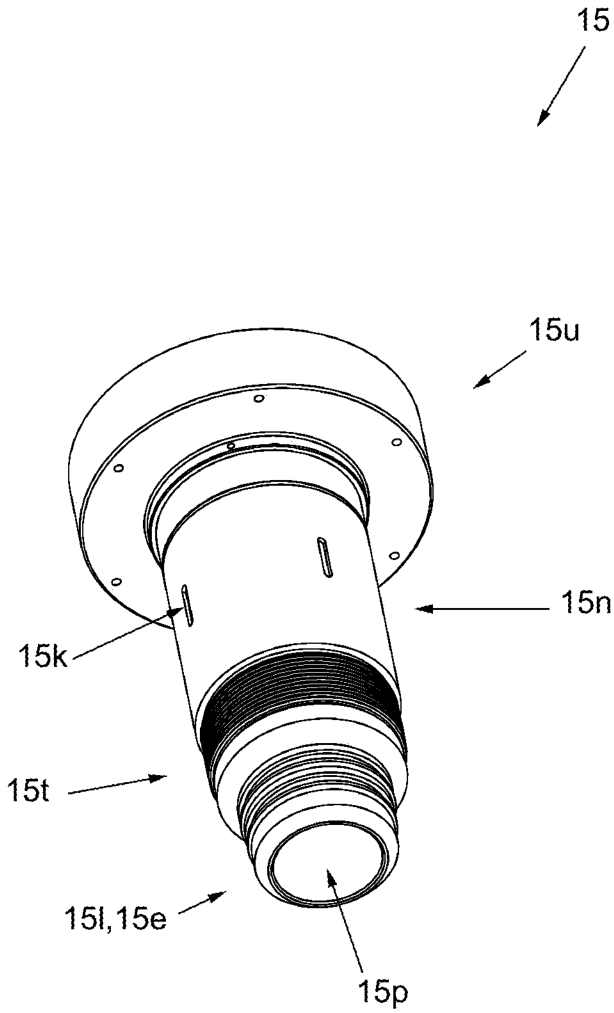


Fig. 8a

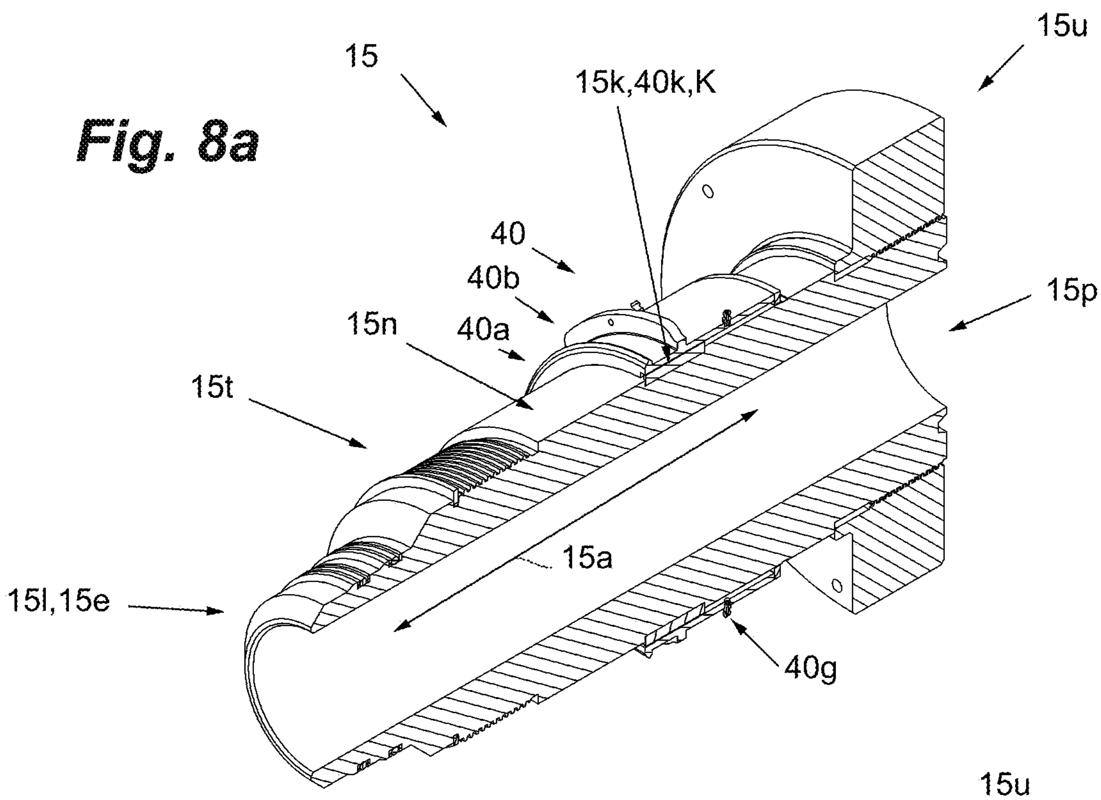

15
15u
15k,40k,K
40
40b
15p
15n
40a
15t
15a
15l,15e
40g

Fig. 8b

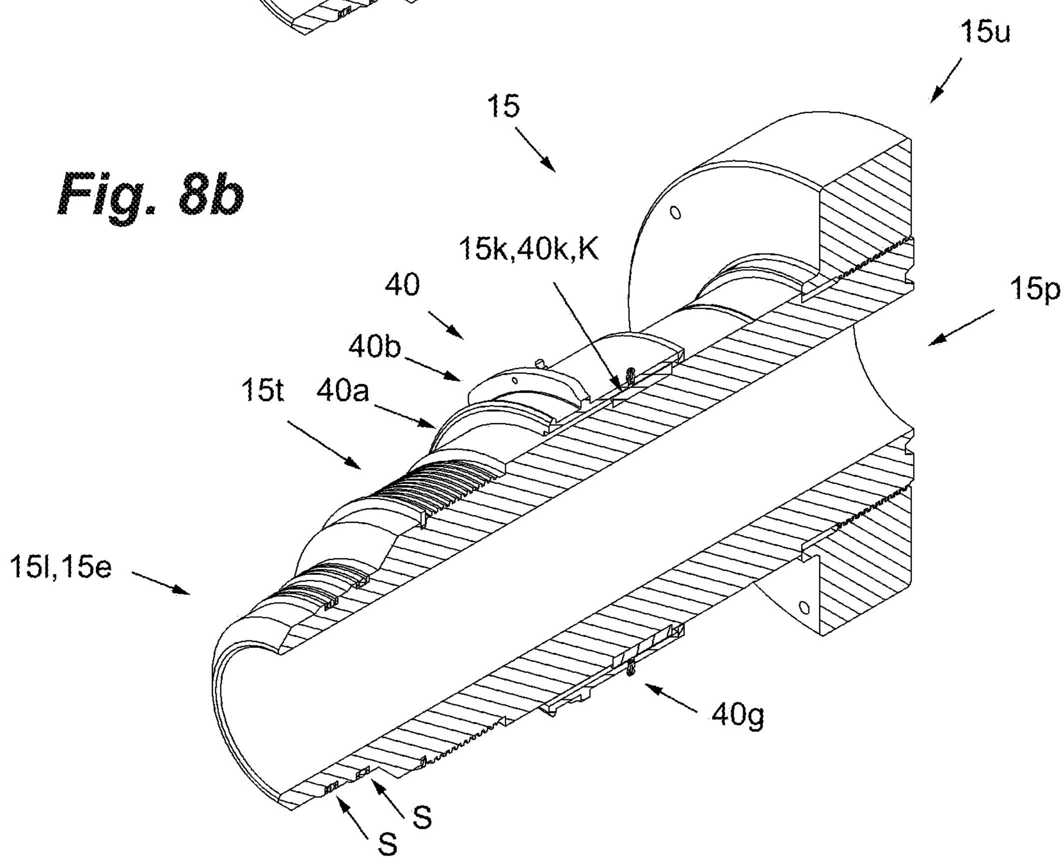

15u
15
15k,40k,K
40
15p
40b
15t
40a
15l,15e
40g
S
S

Fig. 8c

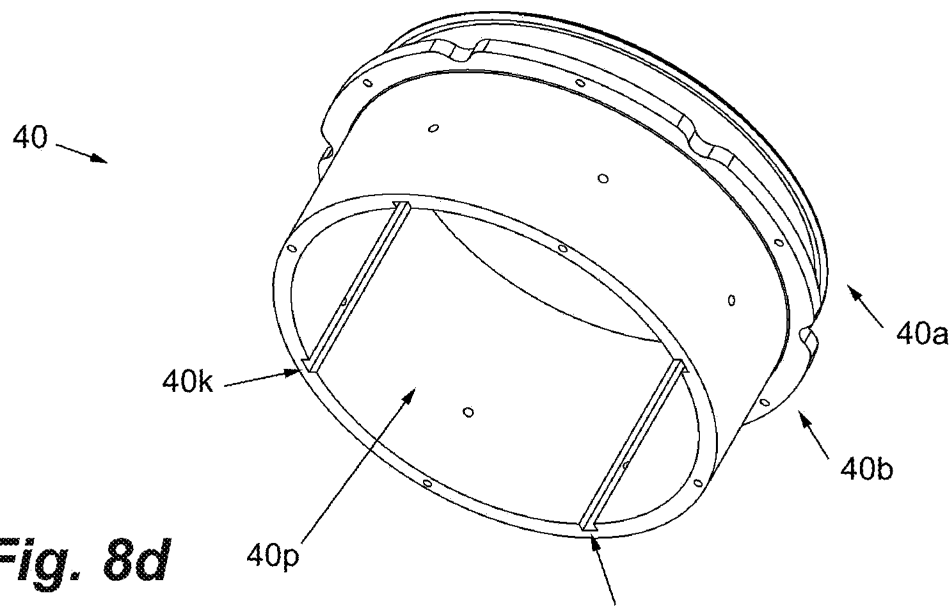


Fig. 8d

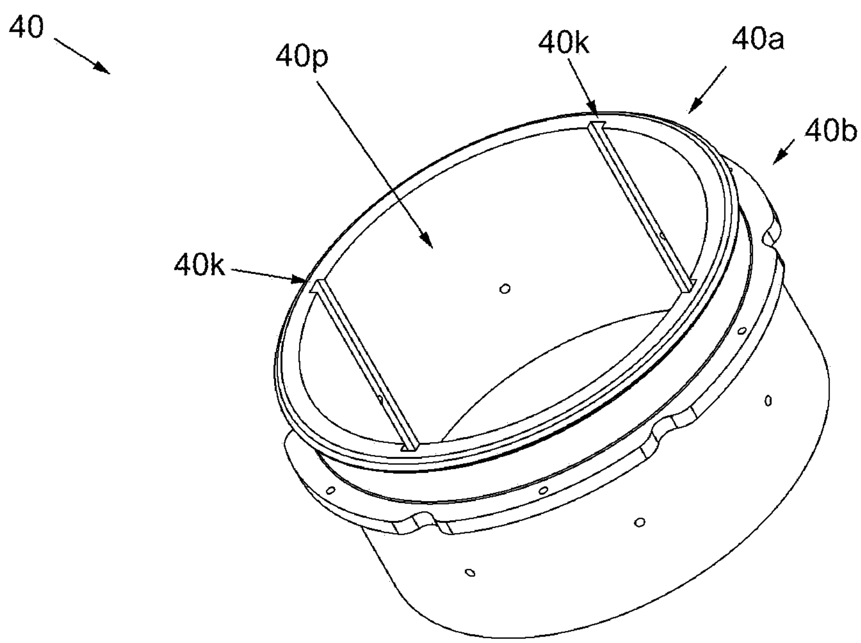


Fig. 9a

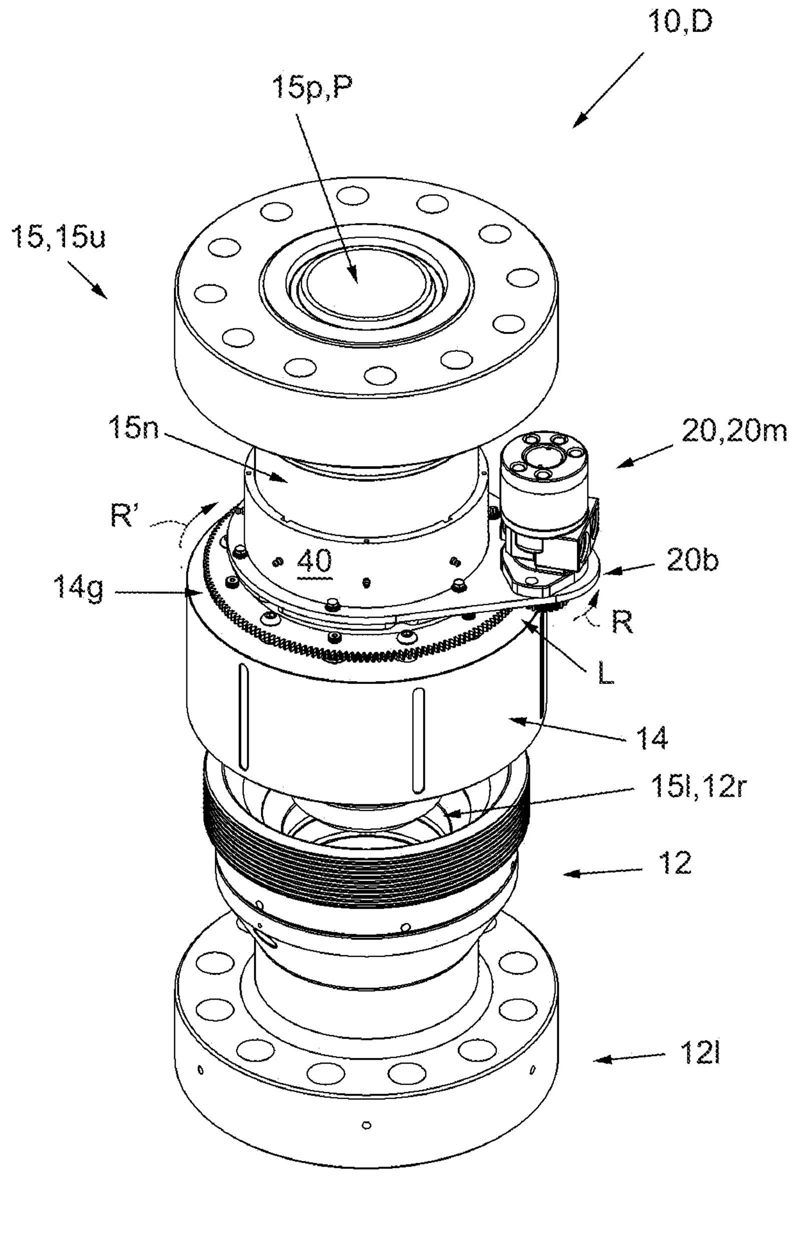


Fig. 9b

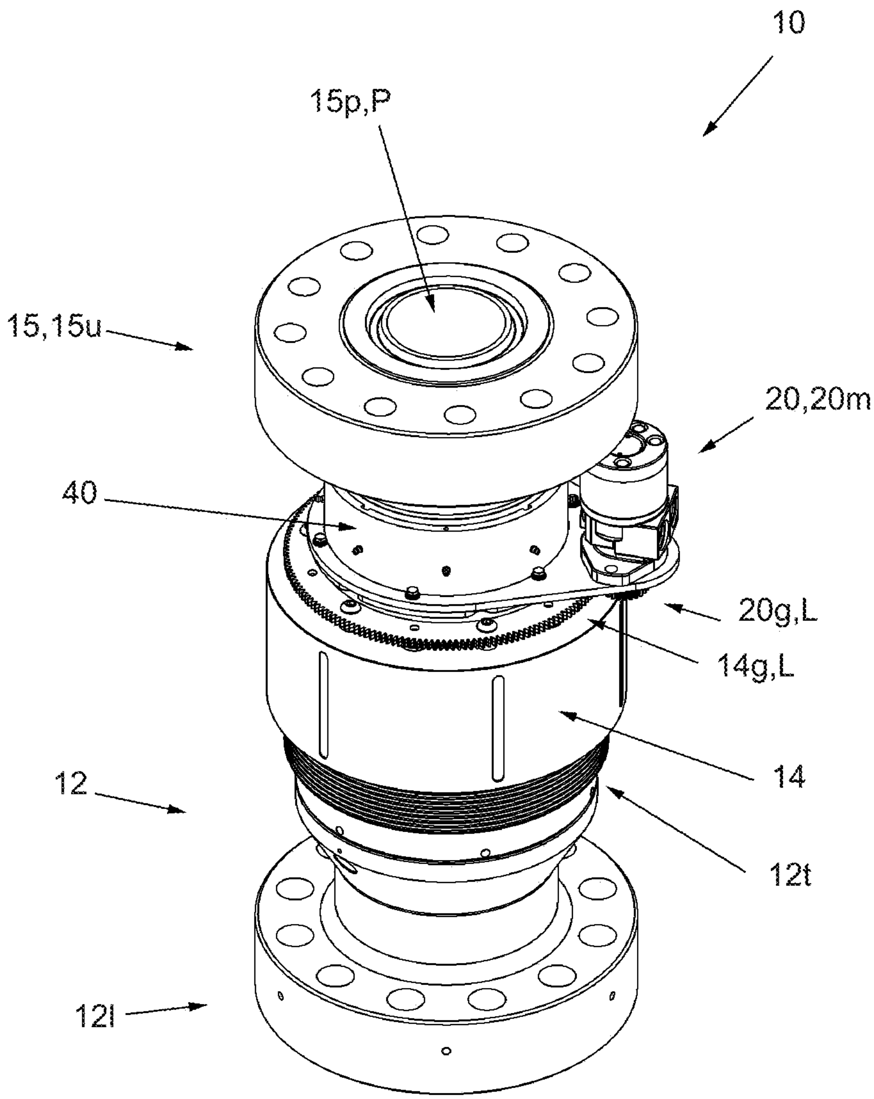


Fig. 9c

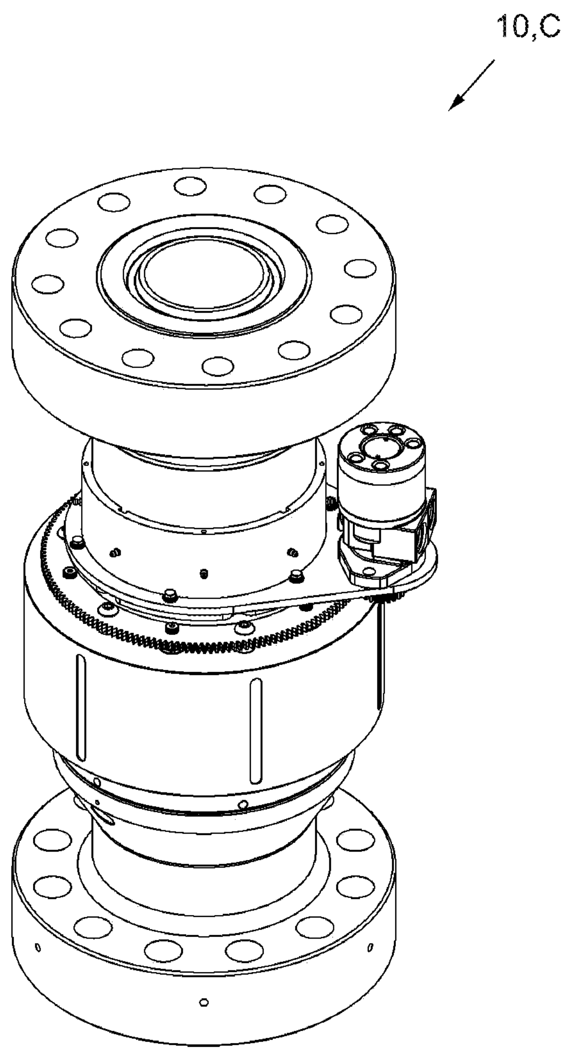


Fig. 10a

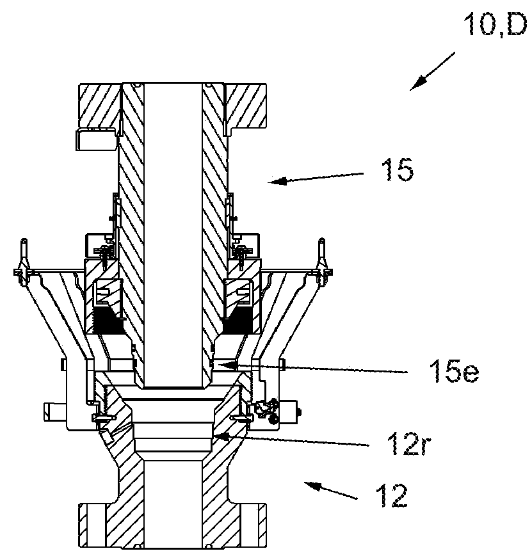


Fig. 10b

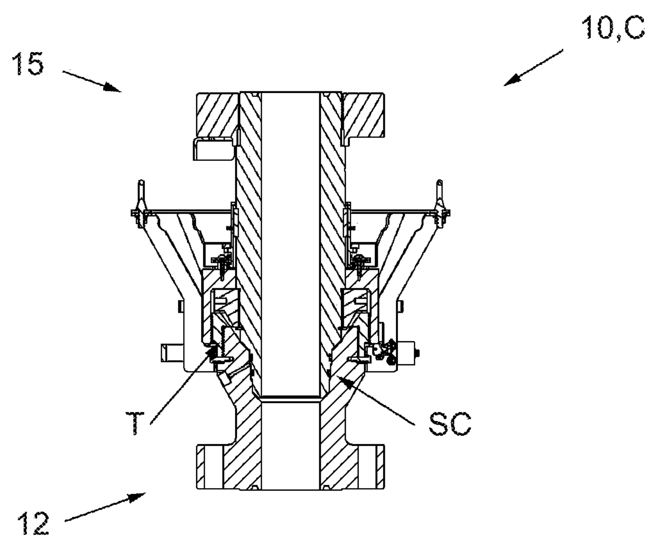


Fig. 11

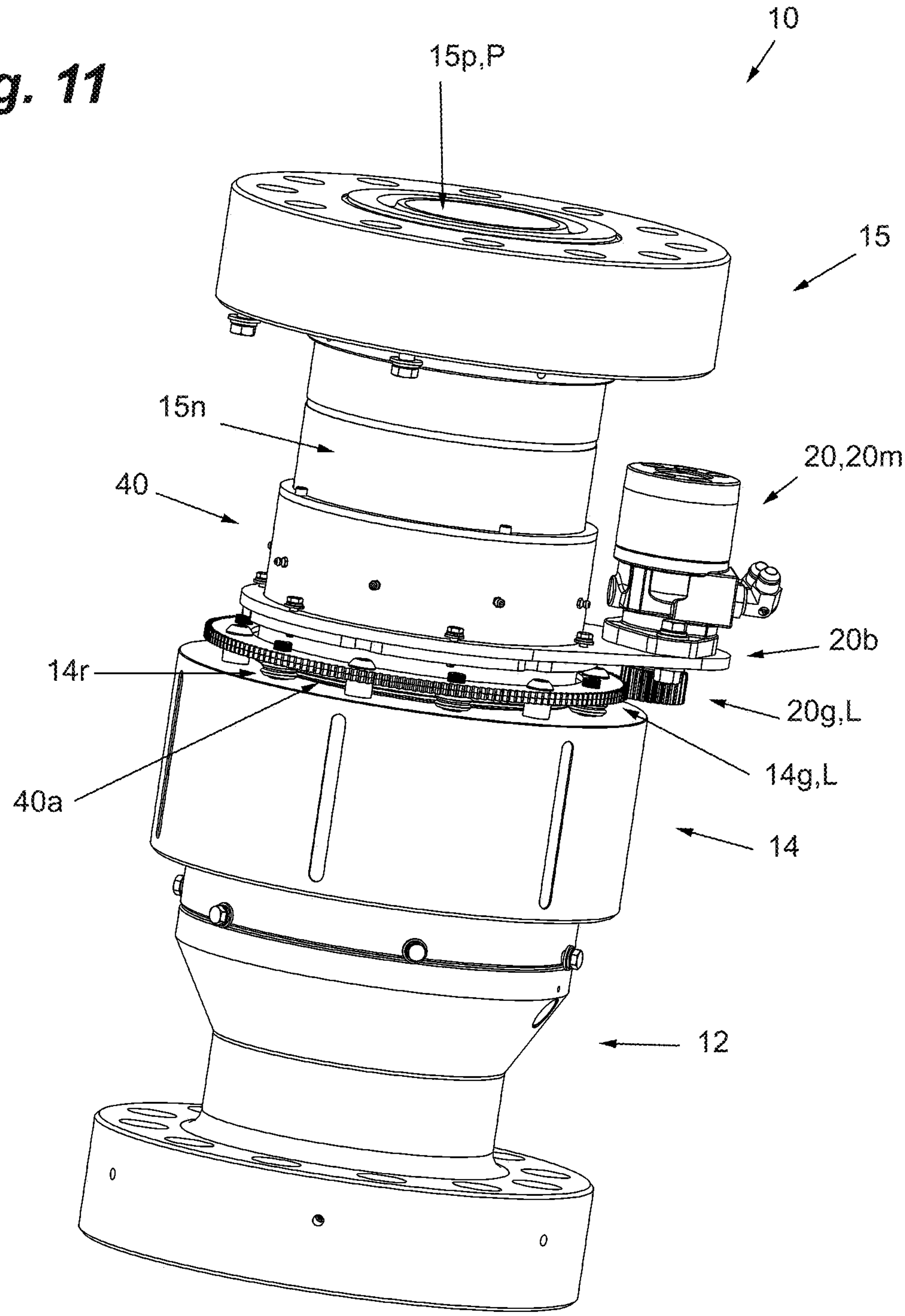


Fig. 12a

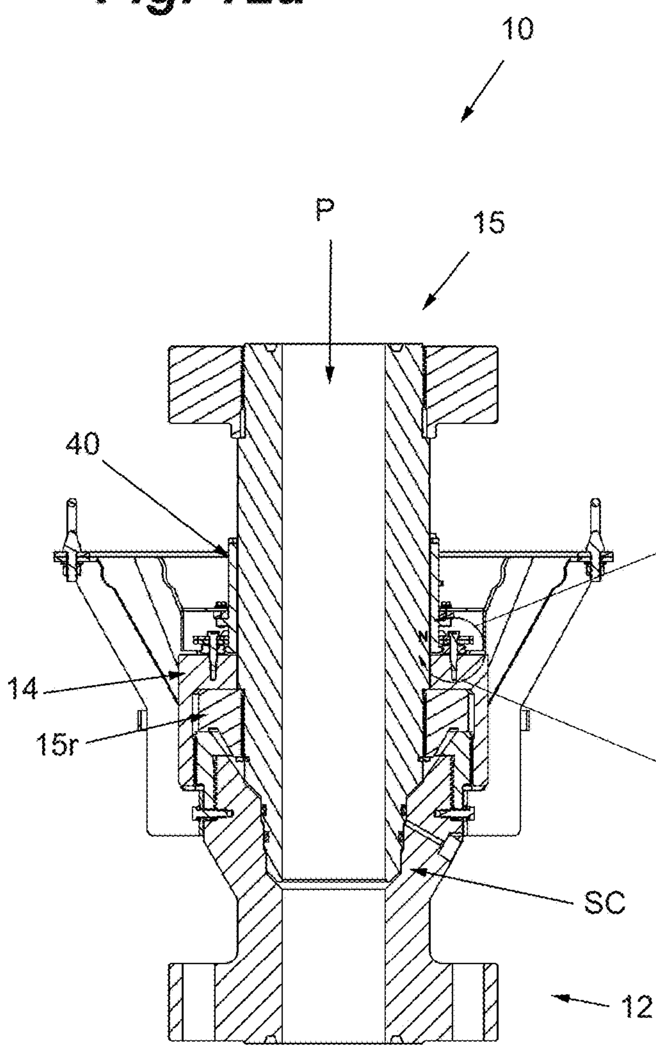
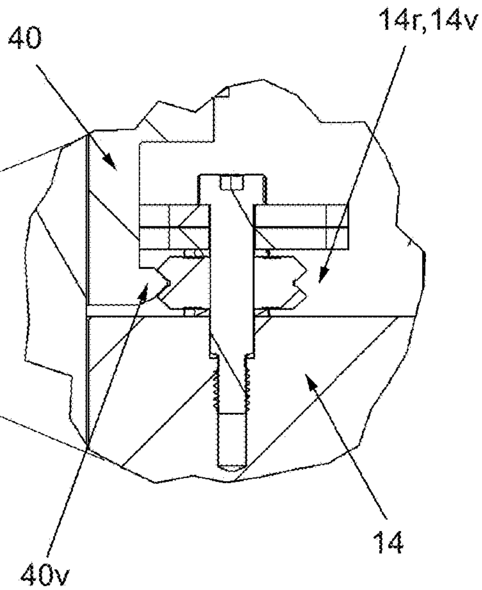


Fig. 12b



REMOTE ACTUATED ROTARY WELLHEAD CONNECTION

FIELD OF THE INVENTION

[0001] This invention relates generally to an apparatus, system and method for connecting pressure control equipment (PCE) to a wellhead. More particularly, the invention relates to apparatus, systems and methods for making remote pressurized connections to a wellhead, without need for manual interaction at the wellhead.

BACKGROUND OF THE INVENTION

[0002] The background information discussed below is presented to better illustrate the novelty and usefulness of the present invention. This background information is not admitted prior art.

[0003] On a multi-wellhead wellsite there is often a need to move PCE, and any associated tool strings, from one wellhead to another wellhead. Conventionally such PCE connections to a wellhead are done manually, e.g., via bolted flanged connection, threaded connection, hand union or hammer union. The PCE is often heavy and, while it is being connected/disconnected to and from the wellhead, it is typically suspended above the wellhead via use of a crane. This often places wellhead operators and wellsite personnel in danger of injury, such as collision with the suspended PCE, or pinched or crushed fingers and hands when securing or removing the connection.

[0004] Remotely actuated wellhead connection systems have been developed, such as that disclosed in U.S. Pat. No. 9,879,496 to Johansen, et al. and in U.S. Pat. No. 10,808, 484. However, these remotely actuated wellhead connection systems typically employ intricate mechanical cams, collets and clamps with complex geometries that require detailed machining during manufacturing. These remotely actuated wellhead connection systems are also expensive and tend to be heavy.

[0005] Therefore, what is needed is a remotely actuated wellhead connection apparatus, system and method that does not suffer from these disadvantages.

SUMMARY OF THE INVENTION

[0006] In an embodiment of the invention, there is provided a remote actuated rotary wellhead connection system for connecting pressure control equipment to a wellhead. The system comprises a flange assembly connectable to the wellhead, a crossover, a nut assembly to threadably secure the crossover to the flange assembly, and a nut assembly actuator to actuate the nut assembly between a threaded, connected state and an unthreaded, disconnected state. The crossover is connectable to the pressure control equipment, and the nut assembly actuator is remotely actuatable.

[0007] In another embodiment of the invention the nut assembly is slidably, rotatably mounted on the crossover.

BRIEF DESCRIPTION OF THE DRAWINGS

[0008] Referring to the drawings, several aspects of the present invention are illustrated by way of example, and not by way of limitation, in detail in the figures, wherein:

[0009] FIG. **1** is a top perspective view of a remote actuated rotary wellhead connector in accordance with a preferred embodiment of the present invention;

[0010] FIG. **2** is a bottom perspective view of the remote actuated rotary wellhead connection of FIG. **1**;

[0011] FIG. **3** is another top perspective view of the remote actuated rotary wellhead connection of FIG. **1**;

[0012] FIG. **4** is a side perspective view showing the main components of the remote actuated rotary wellhead connection of FIG. **1**, and with the other components hidden;

[0013] FIGS. **5***a* and **5***b* are top and bottom views respectively of the remote actuated rotary wellhead connection of FIG. **1**;

[0014] FIG. **6***a* is a perspective view of an exemplary flange assembly of a wellhead connection according to an aspect of the invention, this embodiment having a guide and a plurality of rigid flags mounted to the flange assembly;

[0015] FIG. **6***b* is a sectioned view of the flange assembly of FIG. **6***a;*

[0016] FIG. **6***c* is a bottom perspective view of the flange assembly of FIG. **6***a;*

[0017] FIGS. **6***d*-**6***e* are perspective views of another exemplary flange assembly of a wellhead connection according to an aspect of the invention;

[0018] FIG. **7***a* is a perspective view of an exemplary crossover of a wellhead connection according to an aspect of the invention;

[0019] FIG. **7***b* is a sectioned view of the crossover of FIG. **7***a;*

[0020] FIG. **7***c* is a bottom perspective view of the crossover of FIG. **7***a;*

[0021] FIGS. **8***a*-**8***b* are sectioned perspective views of an exemplary crossover of a wellhead connection according to an aspect of the invention, showing an anti-rotation member mounted thereon, with the anti-rotation member being closer to the upper connection in FIG. **8***a*, with the anti-rotation member being closer to the lower connection in FIG. **8***b;*

[0022] FIGS. **8***c*-**8***d* are perspective views of an exemplary anti-rotation member of a wellhead connection according to an aspect of the invention;

[0023] FIGS. **9***a*-**9***c* are freeze-frame, side perspective views showing the main components of the remote actuated rotary wellhead connection of FIG. **1** moving between a disconnected state (FIG. **9***a*) and connected state (FIG. **9***c*);

[0024] FIGS. **10***a*-**10***b* are freeze-frame, sectioned views showing the remote actuated rotary wellhead connection of FIG. **1** moving between a disconnected state (FIG. **10***a*) and connected state (FIG. **10***b*);

[0025] FIG. **11** is a perspective view showing the main components of the remote actuated rotary wellhead connection of FIG. **1**, and with the other components hidden;

[0026] FIG. **12***a* is a sectioned view of the remote actuated rotary wellhead connection of FIG. **1** in a connected state; and

[0027] FIG. **12***b* is an enlarged view of a portion of FIG. **12***a*.

DEFINITION SECTION

[0028] Horizontal plane, as used herein, refers to a plane that is horizontal at a given point if it is perpendicular to the gradient of the gravity field at that point, in other words, apparent gravity is what makes a plumb bob hang perpendicular to the plane at that point. In other words a horizontal plane in the plane that is perpendicular to the line that passes through the center of the Earth.

[0029] Vertical plane, as used herein, refers in astronomy, geography, geometry, and related sciences and contexts, to a direction passing by a given point if it is locally aligned with the gradient of the Earth's gravity field, i.e., with the direction of the gravitational force (per unit mass, i.e. gravitational acceleration vector) at that point.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0030] The following description is of preferred embodiments by way of example only and without limitation to the combination of features necessary for carrying the invention into effect. Reference is to be had to the Figures in which identical reference numbers identify similar components. The drawing figures are not necessarily to scale and certain features are shown in schematic or diagrammatic form in the interest of clarity and conciseness.

[0031] Additionally, to assist in the description of the invention, words such as top, bottom, upper, lower, above, below, front, rear, right and left are used to describe the accompanying figures. It will be appreciated, however, that the present invention can be located and positioned in a variety of desired positions and angles, and that the various components can be arranged in other suitable configurations. The terms "comprising," "comprises," "including," "includes," "having," "haves," and their grammatical equivalents are used herein to mean that other components, elements or steps are optionally present.

[0032] A first embodiment of a wellhead connection **10** of the present invention is shown in FIGS. **1**-**5***b* and **9***a*-**12***a*. The wellhead connection **10** connects PCE (not shown) to a wellhead (also not shown). The wellhead connection **10** comprises a flange assembly **12** that is connectable to the wellhead (not shown), a nut assembly **14** to threadably secure a crossover **15** to the flange assembly **12**, and a nut assembly actuator **20** to actuate the nut assembly **14** between a threaded, connected state C and an unthreaded, disconnected state D. The crossover **15** is connectable to PCE (not shown). Preferably the nut assembly **14** is slidably, rotatably mounted on the crossover **15** (much like a conventional hand union nut is mounted on a conventional crossover).

[0033] The wellhead connection **10** and its various components are preferably standard API pressure control equipment suitable to handle typical wellbore pressures, preferably with conventional ports to allow for pressure bleed offs, injection of fluid and pressure testing. The wellhead connection **10** has a bore or passage P configured to permit the passage of wellbore fluids from the wellhead to the PCE. Preferably the passage P is an axial bore running along the longitudinal axis **101** of the wellhead connection and sufficiently large to also allow passage of any tool strings associated with the PCE therethrough.

[0034] Preferably the wellhead connection **10** further comprises a guide or funnel **16** to aid in positioning the crossover **15** for subsequent securing to the flange assembly **12** via nut assembly **14**. More preferably, the guide **16** has one or more openings or windows **16***w* so that an operator can view the nut assembly **14**, nut assembly actuator **20** and crossover **15** therethrough as the wellhead connection **10** is actuated between the threaded, connected state C and the unthreaded, disconnected state D. Even more preferably, one or more rigid flags **30** are configured to be positioned in an "up" or "level" position when the wellhead connection **10** is in the threaded, connected state C, and in a "down" position when the wellhead connection **10** is in the unthreaded, disconnected state D.

[0035] Flange assembly **12** can be understood with reference to the embodiments shown in FIGS. **6***a*-**6***e*. The flange assembly **12** is a hollow tubular member, having a flange passage **12***p* therethrough and comprising a first, lower connection **121** for connecting to a wellhead (directly or through intervening equipment) in a conventional manner. Preferably the lower connection **121** is a flanged connection. The flange assembly **12** further comprises a second, upper connection **12***u* for connecting to the crossover **15**. The upper connection **12***u* of the flange assembly **12** includes a receptable **12***r* configured to receive the crossover **15** as further described below. The upper connection **12***u* also further comprises a threaded section **12***t* configured to threadably engage with, and mate to, a threaded section **14***t* on the nut assembly **14** in a conventional manner.

[0036] In embodiments where present, the guide **16** is preferably mounted to the upper connection **12***u* of the flange assembly **12**, e.g., mounted to the outer periphery of the upper connection **12***u* as shown in FIGS. **6***a* and **6***b*. One or more flange assembly lifting lugs **18** are preferably provided on the flange assembly **12** (e.g., on the guide **16**) to assist with lifting and moving the flange assembly **12**, such as via a chains and a crane in a conventional manner. More preferably, the one or more lifting lugs **18** are mounted on the top of the guide **16** as shown in the figures. In embodiments where present, the one or more rigid flags **30** are preferably mounted to the guide **16** adjacent the upper connection **12***u* so that they may be engaged with, and actuated by, the nut assembly **14** when the nut assembly **14** is fully treaded to the upper end **12***u*.

[0037] The crossover **15** can be understood with reference to the embodiments shown in FIGS. **7***a*-**7***c*. The crossover **15** is a hollow tubular member, having a crossover passage **15***p* therethrough, a longitudinal axis **15***a* and comprising a first, upper connection **15***u* for connecting to a PCE (not shown) or a nightcap (not shown) in a conventional manner. Preferably the upper connection **15***u* is a flanged connection. In an alternate embodiment upper connection **15***u* may be a threaded connection (not shown). When the wellhead connection **10** is in the threaded, connected state C, flange passage **12***p* and crossover passage **15***p* cooperate to form passage P.

[0038] The crossover **15** further comprises a second, lower connection **15***l* for connecting to the flange assembly **12**. The lower connection **15***l* of the crossover **15** includes a pin end **15***e* configured to be received by, and sealably mate with, the receptacle **12***r* of the flange assembly **12** so that when energized and/or engaged said flange assembly **12** and crossover **15** form a sealed connection SC (see FIG. **10***b*). In operation, the pin end **15***e* of the crossover **15** is inserted into the receptacle **12***r* of the flange assembly **12**. Preferably, the pin end **15***e* includes mechanisms (e.g., O-rings and/or seals S in grooves or glands) to create a circumferential seal SC between the pin end **15***e* and the receptable **12***r* of the flange assembly **12** for operation at predetermined conditions primarily based on wellhead pressure. The seal mechanism is pressure-dependent, different pressures require different seal designs or materials. The seal mechanisms may also vary depending on fluids in the wellbore or temperature at the wellhead. For example, a different material or cross-sectional shape of the O-ring may be required for sour gas or higher temperatures.

[0039] Preferably a sliding section **15***n* is provided between the upper connection **15***u* and the lower connection

15*l*, the sliding section **15***n* configured to slidably and rotatably support or carry the nut assembly **14**. The nut assembly **14** can thereby slide or travel along the sliding section **15***n* (i.e. in a direction parallel to the longitudinal axis **15***a*) between an engaged position (wherein the nut assembly **14** is closer to the lower end **15***l*) and a disengaged position (wherein the nut assembly **14** is closer to the upper end **15***u*); see FIGS. **9***c* and **9***b* respectively. More preferably, the sliding section **15***n* is configured to slidably support or carry a anti-rotation member **40**, as further described below (see FIGS. **8***a*-**8***d*).

[0040] The crossover **15** preferably further comprises a threaded section **15***t* configured to threadably mount or connect a retaining ring **15***r*. The nut assembly **14** and anti-rotation member **40** are preferably captured and retained on the carrying section **15***n* by the upper flanged connection **15***u* and the retaining ring **15***r* (see FIG. **12***a*). During manufacturing and assembly of the wellhead connection **10**, the nut assembly **14** and anti-rotation member **40** may be positioned over the lower connection **15***l* and slidably placed onto the sliding section **15***n*. Then retaining ring **15***r* is mounted on the threaded section **15***t*.

[0041] Nut assembly **14** has an inside passage or bore **14***p* of sufficient diameter to allow it to slide along sliding section **15**, but not so large as to also slide over the upper flanged connection **15***u* and the retaining ring **15***r* (i.e. the upper flanged connection **15***u* and the retaining ring **15***r* have outside diameters and dimensions that are larger than the diameter of bore **14***p*). Similarly, anti-rotation member **40** has an inside passage or bore **40***p* of sufficient diameter to allow it to slide along sliding section **15**, but not so large as to also slide over the upper flanged connection **15***u* and the retaining ring **15***r* (i.e. the upper flanged connection **15***u* and the retaining ring **15***r* have outside diameters and dimensions that are larger than the diameter of bore **40***p*).

[0042] As will now be appreciated by those skilled in the art, the nut assembly **14** captured on the crossover **15** by retaining ring **15***r* can then be used in a conventional manner as a nut to threadably, sealably connect crossover **15** to flange assembly **12**; i.e. the threaded section **14***t* on the nut assembly **14** will threadably, engage with, and mate to, threaded section **12***t* on the flange assembly **12** to create a threadable connection T and to maintain the pin end **15***e* within the receptacle **12***r* in the sealed connection SC (see FIG. **10***b*).

[0043] Preferably the threaded sections **12***t*, **14***t* on the flange assembly **12** and nut assembly **14** are acme double start thread; i.e. the threads having two starting points exactly 180 degrees opposite to each other. Advantageously this provides two points of contact, so nut assembly will be less likely to lean one way or the other about longitudinal axis **15***a* (as compared to a thread having only a single start). More advantageously, a double start thread will also assists with starting the threading of the nut assembly **14** onto the flange assembly **12**.

[0044] Preferably the nut assembly **14** and the anti-rotation member **40** are slidably linked as further described below (i.e. both the nut assembly **14** and anti-rotation member **40** will slidably move along sliding section **15** in unison), and can rotate relative to each other about the sliding section **15** and around the crossover's longitudinal axis **15***a*. Nut assembly actuator **20** is mounted on, and supported by, the anti-rotation member **40**, as further described below and as can be seen in FIG. **11**).

[0045] Preferably one or more sets of keys K, crossover keyways **15***k* and anti-rotation member keyways **40***k* are provided to slidable retain the anti-rotation member on the crossover **15**; see FIGS. **8***a*-**8***b*. Keys K and keyways **15***k*, **40***k* cooperate in a conventional manner to prevent anti-rotation member **40**, and nut assembly actuator **20** mounted thereon, from rotating about longitudinal axis **15***a* of the crossover **15** and limit the movement of both the anti-rotation member **40** and nut assembly actuator **20** on the crossover **15** to only sliding movement between upper and lower connections **15***u*, **15***l* (i.e. keys K and keyways **40***k*, **15***k* act as an anti-rotation means). More preferably, one or more grease fittings **40***g* are provided to allow for an operator to insert grease and lubrication in the annular space between the crossover **15** and the anti-rotation member.

[0046] In a preferred embodiment, shown in more detail in FIGS. **8***c*-**8***d*, the anti-rotation member **40** further comprises a first hub or circumferential external ridge **40***a* and a second hub or circumferential external ridge **40***b*. The first hub or ridge **40***a* is configured to mate with, and be captured by, one or more rollers **14***r* rotatably mounted on the nut assembly **14**, thereby slidably linking the nut assembly **14** to the anti-rotation member **40** while allowing nut assembly **14** to still rotate relative to anti-rotation member **40** and the crossover **15** (see FIGS. **11**, **12***a* and **12***b*). Preferably the one or more rollers **14***r* are v-groove rollers **14***v* and first hub **40***a* presents a cooperating v-shaped ridge profile **40***v*. The second hub or ridge **40***b* is configured to support and mount the nut assembly actuator **20** to the anti-rotation member **40**. In a preferred embodiment, a mounting bracket **20***b* is provided between the second hub **40***b* and the nut assembly actuator **20** to facilitate mounting the nut assembly actuator to the anti-rotation member.

[0047] Preferably the nut assembly actuator **20** is a hydraulic motor having a first gear **20***g*. In alternate embodiments (not shown) the nut assembly actuator **20** may be an electrical motor having a first gear, or a pneumatic drive having a first gear. Remote actuation of the nut assembly actuator **20** is accomplished in a conventional manner; e.g. via electric wiring, a source of suitable electricity and electric controls if the actuator **20** is an electric motor, via hydraulic hoses, a source of suitable hydraulic fluid and hydraulic controls if the actuator **20** is a hydraulic motor, or via pneumatic hoses, a source of suitable compressed air and pneumatic controls if the actuator **20** is a pneumatic drive. More preferably a second, cooperating gear **14***g* is provided on the nut assembly **14**. First and second gears **20***g*, **14***g* cooperate to provide a rotating linkage L and to rotatably link or couple the nut assembly actuator **20** to the nut assembly (see FIGS. **9***a* and **9***b*). As will now be appreciated by those skilled in the art, because nut assembly actuator **20** is mounted to the anti-rotation member **40**, nut assembly actuator **20** itself cannot rotate relative to the crossover **15**, i.e. nut assembly actuator **20** can only slide along the sliding section **15***n* via anti-rotation member **40**. Nut assembly actuator **20**, when actuated, can spin or rotate the first gear **20***g* (e.g. in direction R) and then, via rotating linkage L and second gear **14***g*, drive or spin the nut assembly **14** (e.g. in direction R'; see FIG. **9***a*). As will now also be appreciated by those skilled in the art, because nut assembly **14** is free to rotate about the crossover **15** and the sliding section **15***n*, nut assembly **14** will rotate when the nut assembly actuator **20** is actuated.

[0048] More preferably, the nut assembly actuator **20** can be actuated to rotate the first gear **20*g*** in both a clockwise and anti-clockwise direction, e.g. by adjusting the direction of hydraulic fluid through hydraulic motor **20*m***. Even more preferably, hydraulic hoses, connections and controls (e.g. valves) are provided to allow an operator to remotely actuate the nut assembly actuator **20** in a conventional manner. Advantageously, an operator can remotely select the direction of rotation of the first gear **20*g*** by controlling the direction of hydraulic fluid through hydraulic motor **20*m*** and, hence, the direction of rotation of the nut assembly **14** and, thereby, drive the nut assembly **14** back and forth between the threaded, connected state C and the unthreaded, disconnected state as may be desired.

[0049] During operations on a wellsite having multiple wellheads (not shown), a plurality of flange assemblies **12** are preferably provided so that each individual wellhead has a flange assembly **12** connected to it. A single crossover **15**, supporting a PCE, may be provided, remotely actuated between connected and disconnected states C,D, moved from one of the plurality of flange assemblies **12** to another 12 and then be remotely actuated between disconnected and connected states C,D as may be desired by a wellsite operate. The single crossover **15** may be moved between the plurality of flange assemblies **12** in a conventional manner, such as via chains and a crane in a conventional manner.

[0050] Although the disclosed high pressure seal embodiments have been described with reference to an exemplary application in pressure control at a wellhead, alternative applications could include, for example, areas such as deep core drilling, offshore drilling, methane drilling, open hole applications, hydraulic fracturing, wireline operations, coil tubing operations, mining operations, and various operations where connections are needed under a suspended or inaccessible load (i.e., underwater, hazardous area).

[0051] Unless otherwise specified, it is preferred that the components of the invention be made of suitable high-strength materials capable of taking stresses and strains during its intended use during well operations. Exemplary materials used in the construction of the disclosed wellhead connection embodiments include high strength alloy steels, high strength polymers, and various grades of elastomers and seals S.

[0052] Those of ordinary skill in the art will appreciate that various modifications to the invention as described herein will be possible without falling outside the scope of the invention. In the claims, the word "comprising" is used in its inclusive sense and does not exclude other elements being present. The indefinite article "a" before a claim feature does not exclude more than one of the features being present.

1. A remote actuated rotary wellhead connection system for connecting pressure control equipment to a wellhead, the system comprising:

a flange assembly (**12**) connectable to the wellhead;

a crossover (**15**);

a nut assembly (**14**) to threadably secure the crossover (**15**) to the flange assembly **12**; and

a nut assembly actuator (**20**) to actuate the nut assembly (**14**) between a threaded, connected state and an unthreaded, disconnected state;

wherein the crossover (**15**) is connectable to the pressure control equipment; and

wherein the nut assembly actuator (**20**) is remotely actuatable.

2. The remote actuated rotary wellhead connection system of claim **1** wherein the nut assembly (**14**) is slidably, rotatably mounted on the crossover (**15**).

3. The remote actuated rotary wellhead connection system of claim **2** further comprising a guide (**16**) to assist in positioning the crossover (**15**) for subsequent securing to the flange assembly (**12**) via nut assembly (**14**).

4. The remote actuated rotary wellhead connection system of claim **3** the wherein the guide (**16**) has one or more windows (**16*w***).

5. The remote actuated rotary wellhead connection system of claim **2** wherein the flange assembly (**12**) is a hollow tubular member, having a flange passage (**12*p***) therethrough and further comprises:

a first connection (**121**) for connecting to the wellhead; and

a second connection (**12*u***) for connecting to the crossover (**15**).

6. The remote actuated rotary wellhead connection system of claim **5** wherein the first connection (**121**) is a flanged connection;

wherein the second connection (**12*u***) comprises a receptable (**12*r***) configured to receive the crossover (**15**);

wherein the nut assembly (**14**) comprises a threaded section (**14*t***); and

wherein the upper connection (**12*u***) further comprises a threaded section (**12*t***) configured to threadably engage with the threaded section (**14*t***).

7. The remote actuated rotary wellhead connection system of claim **6** wherein the crossover (**15**) is a hollow tubular member having a crossover passage (**15*p***), a longitudinal axis (**15*a***), a first connection (**15*u***) for connecting to the pressure control equipment, and a second connection (**15*l***) for connecting to the flange assembly (**12**).

8. The remote actuated rotary wellhead connection system of claim **7** wherein the first connection (**15*l***) of the crossover (**15**) comprises a pin end (**15*e***) sealably receivable by the receptacle (**12*r***) to form a sealed connection.

9. The remote actuated rotary wellhead connection system of claim **8** wherein the crossover (**15**) further comprises a sliding section (**15*n***) between the first connection (**15*u***) and the second connection (**15*l***), said sliding section **15*n*** configured to slidably and rotatably carry the nut assembly (**14**) in a direction parallel to the longitudinal axis (**15*a***) between an engaged position and a disengaged position.

10. The remote actuated rotary wellhead connection system of claim **9** further comprising an anti-rotation member (**40**) slidably supported by the sliding section (**15*n***).

11. The remote actuated rotary wellhead connection system of claim **10** wherein the crossover (**15**) further comprises a threaded section (**15*t***) configured to threadably mount a retaining ring (**15*r***).

12. The remote actuated rotary wellhead connection system of claim **11** wherein the first connection (**15*u***) is a flanged connection; and

wherein the nut assembly (**14**) and the anti-rotation member (**40**) are slidably captured on the carrying section (**15*n***) between the flanged connection (**15*u***) and the retaining ring (**15*r***).

13. The remote actuated rotary wellhead connection system of claim **12** wherein the nut assembly (**14**) and the anti-rotation member (**40**) are slidably linked, can rotate relative to each other about the sliding section (**15***n*) and can rotate around the longitudinal axis (**15***a*).

14. The remote actuated rotary wellhead connection system of claim **14** wherein the nut assembly actuator (**20**) is mounted on, and supported by, the anti-rotation member (**40**).

15. The remote actuated rotary wellhead connection system of claim **14** further comprising:

at least one key (K);

at least one crossover keyway (**15***k*); and

at least one anti-rotation member keyway (**40***k*);

wherein said at least one key (K), said at least one crossover keyway (**15***k*) and said at least one anti-rotation member keyway (**40**K) cooperate to slidably retain the anti-rotation member (**40**) on the sliding section (**15***n*).

16. The remote actuated rotary wellhead connection system of claim **10** further comprising at least one roller (**14***r*) rotatably mounted on the nut assembly **14**;

wherein the anti-rotation member (**40**) further comprises a first hub (**40***a*);

wherein the first hub (**40***a*) is captured by the at least one roller (**14***r*) to slidably link the nut assembly (**14**) to the anti-rotation member (**40**) while allowing nut assembly (**14**) to rotate relative to anti-rotation member (**40**) and the crossover (**15**).

17. The remote actuated rotary wellhead connection system of claim **16** wherein the anti-rotation member (**40**) further comprises a second hub (**40***b*); and

wherein the second hub (**40***b*) is configured to mount the nut assembly actuator (**20**) to the anti-rotation member (**40**).

18. The remote actuated rotary wellhead connection system of claim **1** wherein the nut assembly actuator (**20**) is a hydraulic motor.

19. The remote actuated rotary wellhead connection system of claim **18** wherein the nut assembly actuator (**20**) is a hydraulic motor having a first gear (**20***g*);

wherein the nut assembly (**14**) further comprises a second gear (**14***g*); and

wherein the first gear (**20***g*) and the second gear (**14***g*) cooperate to rotatably link the nut assembly actuator (**20**) to the nut assembly (**14**).

20. The remote actuated rotary wellhead connection system of claim **1** wherein the nut assembly actuator (**20**) is selected from group consisting of a hydraulic motor, an electric motor and a pneumatic motor.

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