IMPROVED BLOWOUT PREVENTER

CROSS-REFERENCE TO RELATED APPLICATIONS

This application claims the benefit of U.S. Provisional Patent Application Serial No. 61/494,518, filed on June 8, 2011, the entire disclosure of which is hereby incorporated by reference.

BACKGROUND

Blowout preventers are used extensively throughout the oil and gas industry. Typical blowout preventers may comprise a main body to which are attached various types of ram units. The two categories of blowout preventers that are most prevalent are ram blowout preventers and annular blowout preventers. Blowout preventer stacks frequently utilize both types, typically with at least one annular blowout preventer stacked above several ram blowout preventers. The ram units in ram blowout preventers allow for both the shearing of the drill pipe and the sealing of the blowout preventer. Typically, a blowout preventer stack may be secured to a wellhead and may provide a safe means for sealing the well in the event of a system failure.

In a typical blowout preventer, a ram bonnet assembly may be bolted to the main body using a number of high tensile bolts or studs. These bolts are required to hold the bonnet in position to enable the sealing arrangements to work effectively. Typically an elastomeric sealing element is used between the ram bonnet and the main body. There are several configurations, but essentially they are all directed to preventing a leakage bypass between the mating faces of the ram bonnet and the main body.

During normal operation, the blowout preventers may be subject to pressures up to 138 megapascals (MPa) (20,000 psi), or even higher. These high pressures often place a severe loading the retaining bolts that are used to hold the ram units in position. Consequently a large number of bolts must be employed of sufficient size to contain the force in conventional blowout preventers. Maintenance of this large number of bolts is often a cumbersome process.

The high pressures also may affect the performance of the elastomeric sealing arrangements. These elastomeric seals can degrade over time and thus require scheduled maintenance. In order to perform this maintenance, the ram bonnet must be disassembled from the main body. Because of the large numbers of bolts, the disassembly and reassembly of the blowout preventers to maintain the elastomeric sealing arrangement may also be a cumbersome process.

What is claimed is:

1. A blowout preventer comprising:

a main body forming intersecting horizontal and vertical passageways extending through the main body wherein the horizontal passageway forms a ram location, the main body comprising a seal seating profile disposed on an outside surface of the main body around the ram location, one or more bonnet guideways disposed on the surface of the main body, and one or more slide guideways disposed on the surface of the main body;

a bonnet attached to the main body, wherein the bonnet comprises one or more guide rods that engage the one or more bonnet guideways of the main body, a ram unit capable of seating in the ram location of the main body, and a seal seating profile disposed on a surface of the bonnet;

two retention units attached to opposite sides of the main body and attached to opposite sides of the bonnet, wherein each retention unit comprise a clamp block in engagement with the bonnet, one or more guide rods in engagement with the one or more slide guideways of the main body, and a bonnet guideway in engagement with the one or more guide rods of the bonnet; and

a metal seal, wherein the metal seal is seated in the seal seating profile of the main body and the seal seating profile of the bonnet.

2. A blowout preventer comprising:

a main body forming intersecting horizontal and vertical passageways extending through the main body ~~wherein the horizontal passageway forms a ram location, the main body comprising a seal seating profile disposed on an outside surface of the main body around the ram location~~;

a first bonnet attached to a first side of the main body by means of one or more high load capacity fasteners, wherein the one or more high load capacity fasteners comprise a series of tappings~~the bonnet comprises a seal seating profile disposed on a~~

~~surface of the bonnet and a ram unit that is capable of seating in the ram location of the main body~~; and

a second bonnet attached to a second side of the main body by means of one or more high load capacity fasteners, wherein the one or more high load capacity fasteners comprise a series of tappings;

wherein the first and second bonnets comprise through guide bars, wherein the through guide bars of the first bonnet are simple diameter bars capable of engaging the second bonnet and capable of supporting the first bonnet as the first bonnet is slid out of the main body, and wherein the through guide bars of the second bonnet are simple diameter bars capable of engaging the first bonnet and capable of supporting the second bonnet as the second bonnet is slid out of the main body~~a metal seal, wherein the metal seal is seated in the seal seating profile of the main body and the seal seating profile of the bonnet~~.

3. The blowout preventer of claim 2, wherein each of the first and second bonnets comprises a thick flange.

4. The blowout preventer of claim 2, wherein each of the bonnets comprises a bonnet lid.

5. The blowout preventer of claim 2, wherein~~: the bonnet is attached to the main body by the use of a high load capacity fastener~~

the horizontal passageway forms a ram location, the main body comprises a seal seating profile disposed on an outside surface of the main body around the ram location;

the first bonnet comprises a seal seating profile disposed on a surface of the first bonnet and a ram unit that is capable of seating in the ram location of the main body; and

the blowout prevent further comprises a metal seal, wherein the metal seal is seated in the seal seating profile of the main body and the seal seating profile of the first bonnet.

6. The blowout preventer of claim 2, wherein the horizontal passageway is non-circular.

7. The blowout preventer of claim 2 further comprising a replaceable seal facing disposed within the vertical passageway of the main body.

8. A blowout preventer comprising:

a main body forming intersecting horizontal and vertical passageways extending through the main body wherein the horizontal passageway forms a ram location and

a bonnet attached to the main body, wherein the bonnet comprises a ram unit comprising a serrated shear blade, wherein the ram unit is capable of seating in the ram location of the main body~~.~~

~~9. The blowout preventer of claim 8,~~ and wherein the serrated shear blade comprises at least one set of serrations and a final profile, wherein each set of serrations are positioned such that they engage and shear different sections of a drill pipe, and wherein the final profile comprises an inwardly extending projection extending toward a central axis of the vertical passageways extending through the main body, the inwardly extending projection being capable of closing off a drill pipe disposed in the vertical passageways prior to shearing a remaining section of the drill pipe via outwardly extending portions of the final profile.

9~~10~~. The blowout preventer of claim 8 further comprising a metal seal, wherein the metal seal is seated in a seal seating profile disposed around the ram location of the main body and a seal seating profile disposed on a surface of the bonnet.

10~~11~~. The blowout preventer of claim 8 further comprising a replaceable seal facing disposed within the vertical passageway of the main body, wherein the replaceable seal facing provides a sealing interface for the shear blade.

~~12. A blowout preventer comprising:~~

~~a main body forming intersecting horizontal and vertical passageways extending through the main body;~~

~~a first bonnet attached to a first side of the main body by means of one or more high load capacity fasteners, wherein the one or more high load capacity fasteners comprise a series of tappings; and~~

~~a second bonnet attached to a second side of the main body by means of one or more high load capacity fasteners, wherein the one or more high load capacity fasteners comprise a series of tappings.~~

~~13. The blowout preventer of claim 12, wherein the first and second bonnets comprise thick flanges.~~

~~14. The blowout preventer of claim 12, wherein the first and second bonnets comprise removable bonnet lids.~~

~~15. The blowout preventer of claim 12, wherein the first and second bonnets comprise through guide bars, wherein the through guide bars of the first bonnet are capable of engaging the second bonnet and wherein the through guide bars of the second bonnet are capable of engaging the first bonnet.~~

~~16. The blowout preventer of claim 12, wherein the first and second bonnets comprise serrated shear blades.~~

~~17. The blowout preventer of claim 16, wherein the serrated shear blades of the first and second bonnets are capable of forming an interlocking arrangement.~~

~~18. The blowout preventer of claim 17 further comprising a replaceable seal facing disposed within the vertical passageway of the main body, wherein the replaceable seal~~

~~facing provides a sealing interface for the shear blades when in an interlocking arrangement.~~

~~19. A blowout preventer comprising:~~

~~a main body forming intersecting horizontal and vertical passageways extending through the main body wherein the horizontal passageway forms a ram location and~~

~~a bonnet attached to the main body, wherein the bonnet comprises a ram unit and an autolock device comprising a sprung loaded latch and a central lock spindle comprising a shoulder feature, wherein the ram unit is capable of seating in the ram location of the main body and wherein the sprung loaded latch of autolock device is capable of engaging the shoulder feature on the central lock spindle when the ram unit is in a closed position.~~

11~~20~~. A blowout preventer comprising:

a main body forming intersecting horizontal and vertical passageways extending through the main body wherein the horizontal passageway forms a ram location and

a bonnet attached to the main body, wherein the bonnet comprises a ram unit and a variable ram locking device comprising:

~~locking wedges and~~ a central lock spindle having~~comprising~~ a tapered feature;

a locking wedge;

a tapered feature formed in a center core of the ram unit;~~,~~

wherein the ram unit is capable of seating in the ram location of the main body and wherein the locking wedges of the variable ram locking device is~~are~~ capable of engaging the tapered feature of the central spindle and the tapered feature in the center core of the ram unit to lock~~when~~ the ram unit ~~is~~ in a fully closed position, an open position, or a partially closed position.