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(54) **Title**: DUAL DRILLING ACTIVITY DRILLING SHIP

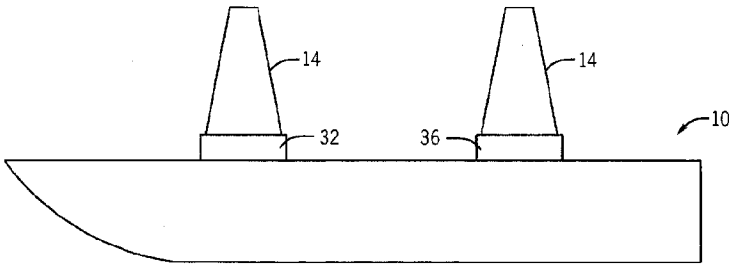

FIG. 2

(57) **Abstract**: A single drilling ship may be equipped with two drilling centers, each capable of running risers. Each drilling center has a set of tubulars stored for use in association with that drilling center, those tubulars including risers. However, the risers for one drilling center are of a smaller diameter than the risers for the other drilling center. In the event that a main drilling center drilled well fails, a relief well can then be drilled from the same ship using a secondary drilling center.

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Dual Drilling Activity Drilling Ship

This invention relates generally to offshore drilling operations.

Offshore drilling operations may be implemented with a variety of different platforms which may be secured to the seabed floor. These platforms may be effective at shallower depths. In greater depths, it is generally desirable to use ships or semi-submersible rigs to conduct such deep water drilling operations.

These ships or rigs may be precisely positioned at a desired location so that the drilling equipment may be operated to precisely drill wells at desired locations. The ship or rig may be maintained in position under dynamic positioning, even in extreme seas. As used herein, a "ship" is a floating platform capable of propulsion on it own or by being pushed pulled, or towed. It includes semi-submersible rigs and self-propelled vessels.

As a result, a number of exploration wells may be drilled, one after another, in a deep water offshore environment, such as the outer continental shelf of the United States, Africa, Asia, or Western Europe. However, the large number of operations must be performed when successfully drilling a number of exploration wells, even in the same area, may be extremely time consuming because of the complexity of deep water operations.

With a conventional ship having a single drilling platform, it is impossible to perform multiple operations in parallel. Thus, the time periods needed to complete each well may be relatively long. Since, generally, these drilling ships are operated on a rental basis, the longer than it takes to drill the well, the more expensive is the resulting well.

So called dual activity drilling ships are known. In these ships, a pair of derricks may be provided on the ship, which provide a structural support for underlying drilling tubulars. The dual derricks may be operated in some degree in parallel. For example, while one operation is occurring on one derrick, another operation may be implemented on another derrick. However, any in case, only one well may be drilled, one of the drilling centers being used for drilling and the other center being used for supporting a single drilling operation.

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According to a first aspect of the present invention, there is provided a method comprising:

outfitting a drilling ship with two separate and distinct drilling centers, for drilling two different wells, one with each drilling center; and

providing marine risers for each of said drilling centers, the marine risers for one of the drilling centers being of a smaller diameter than the marine risers for the other of said drilling centers; and

providing equipment to enable a relief well to be drilled from the same ship that drilled a failed well.

According to a second aspect of the present invention, there is provided a drilling ship comprising:

a first drilling center to drill a first well, said first drilling center including storage to store first marine risers; and

a second drilling center to drill a second well from the same ship, the second drilling center including storage to store second marine risers, said second marine risers having a smaller diameter than said first marine risers, the ship enabling a relief well to be drilled from said second drilling center when a well drilled from said first drilling center has failed.

The present invention will now be described, by way of non-limiting example only, with reference to the accompanying drawings, in which:

Figure 1 is a top plan view of a drilling ship in accordance with one embodiment;

Figure 2 is a side elevational view of the ship shown in Figure 1 in accordance with one embodiment;

Figure 3 is a schematic depiction of a drilling operation from the main drilling center on the ship shown in Figure 2 in accordance with one embodiment;

Figure 4 is a schematic depiction of drilling from the secondary drilling center in accordance with one embodiment; and

Figure 5 is a schematic depiction of the disconnection of the main drilling center from the well head in response to a failure, in accordance with one embodiment.

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Referring to Figure 1, a dual drilling activity drilling ship 10 may be a ship capable of drilling operations in deep and ultra deep water. The ship 10 may also be a semi-submersible rig, as well. The ship may be equipped with conventional dynamic positioning controls which enable the ship to be precisely positioned at a precisely determined location. Moreover, the ship may be held precisely in position during drilling operations pursuant to computer control.

In some embodiments, a main drilling center 14 and a secondary drilling center 12 may be provided. Each of these drilling centers is capable of running risers. In some embodiments, the main drilling center 14 is used for primary drilling operations. In the event of a failure, the main drilling center can be disconnected, the ship can be moved to position the secondary drilling center 12, and risers may be lowered from the secondary drilling center to drill a relief well in association with the failed drilling operation from the main drill center.

Dual drilling activity drilling ships may have a wide variety of applications. For example, in arctic drilling operations, it is generally desired to have a backup drill ship on site. That way, if the primary drill ship runs into a problem, the secondary drill ship can take over. But given the cost of drilling ships, having two ships on site is extremely expensive. In accordance with some embodiments of the present invention, a single drill ship can perform the same capabilities that required two

drilling ships in the past. It should be noted that conventional dual activity drill ships cannot drill from two different centers and do not have the capability of supplying risers for marine drilling from two different centers.

In one embodiment, the main and secondary drilling centers may be implemented by hydraulic RAM devices. In other embodiments, derricks or superstructures may be provided. Such derricks or superstructures may provide structural support for the tubulars hung from such derricks.

In contrast, with hydraulic RAM systems, the tubulars may be supported directly on the ship's deck. This avoids the need for expensive, heavy derricks to support the tubulars. However, in some embodiments, even using a hydraulic system, masts, or guides may be provided to guide the tubulars when they are in their uphauled positions.

Thus, depending on the nature of the centers 12 and 14, different tubular storage facilities may be utilized. For example, when a derrick system is utilized, the derricks are of sufficient strength that tubulars may be stored by simply leaning them against the insides of the derricks. In other cases, tubular storage systems, set back envelopes, and racks may be provided to hold the assembled or partially assembled tubulars.

As shown in Figure 1, in accordance with one embodiment, racks 30 and 32 are associated with the secondary drilling center 12 and racks 34 and 36 may be associated with the main drilling center 14. The racks 34 and 36 may hold a variety of tubulars, including risers. Similarly, the racks 30 and 32, associated with the secondary drilling center, may also hold a variety of tubulars, including risers. However, in some embodiments, the risers used in association with the secondary drilling center may be smaller diameter risers to reduce the overall load on the ship, while still providing full drilling capability from the secondary drilling center.

For example, a conventional marine drilling riser may have a nominal 21¼ inches inside diameter, while the risers stored in the racks 30 and 32, associated with the secondary drilling center, may be a smaller diameter, such as 13⅝ inch internal diameter, 10,000psi risers.

While, in Figure 2, the racks 32 and 36 are shown to the port side of the drilling centers 12 and 14, the racks may be positioned fore and aft or both fore and

aft and port and starboard positions in some embodiments. Moreover, as described above, in some embodiments, separate racks may not be needed and the tubulars may be simply leaned against the drilling centers 12 and 14 when possible.

Conventional equipment may be used for advancing, running, withdrawing, lifting, or rotating the tubulars to the seabed and, ultimately, into the seabed floor. In this regard, waste, top drives, sheaves, draw works, rotary tables, traveling blocks, motion compensators, hydraulic RAMS, or any other known equipment may be utilized. The hydraulic RAM may support tubulars on the deck, but derricks may support tubulars from above the deck. The present invention is in no way limited to any particular equipment.

Referring now to Figure 3, the main drilling center 14 includes riser tensioners 22. It also includes the marine riser 24, which may be nominally 21¼ inch outside diameter conventional marine riser in one embodiment. A mechanical override emergency riser disconnector 25 may be provided at the bottom of the riser 24. Connected to the disconnector 25 may be a lower marine riser package (LMRP) 26a. The LMRP 26a functions to disconnect the blowup preventer (BOP) 26 which is connected to the LMRP 26a by a frangible connection. Finally, the BOP 26 may, in one embodiment, be a conventional 18¾ inch inside diameter subsea blowout preventer in one embodiment.

A lower marine riser package (LMRP) 27 is coupled to the blowout preventer 26 to disconnect the upper components from the underlying subsea shutoff assembly (SSA) 27. In one embodiment, the SSA 27 may have controls that are independent from the controls used for the BOP 26. In one embodiment, the subsea shutoff assembly may be 18¾ inch internal diameter, conventional equipment.

Finally, a subsea wellhead 28 may be cemented into the seabed. The wellhead may be an 18¾ inch inside diameter conventional wellhead, in some embodiments.

Thus, the wellhead 28 may be established from the main drilling center 14 and if no problems develop, the secondary drilling center 12 may not be needed. However, in some embodiments, dual activity may be implemented so that some tubulars may be made up in advance from the secondary drilling center 12 to facilitate drilling from the main drilling center 14. In other embodiments, the drilling

center 12 is only held for backup in case a failure occurs in connection with the main drilling center 14.

Referring to Figure 4, in the case where the secondary drilling center 12 is being activated, a blowout preventer with a slim high pressure riser 40 enables drilling of a relief well from the secondary well center 12. This may be advantageous when a failure occurs in the main drilling center and the main drilling center can no longer be operated. For safety reasons, it may be desired to provide a relief well as soon as possible. However, a second drilling ship may not be needed, in some embodiments, since this capability may be provided on board a single drilling ship.

The riser tensioners 38 may be permanently installed on the secondary well center 12. An upper blowout preventer 39 may be provided. In one embodiment, the BOP 39 may be a 13⅝ inch inside diameter blowout preventer. The riser 40 may be a smaller diameter riser that is capable of handling 10,000psi pressure and having an internal diameter of 13⅝ inch in one embodiment. Because it has a smaller diameter, the riser 40 can be more easily carried on the same ship with the riser 24 without overweighting the ship, in some embodiments.

A lower marine riser package (LMRP) 42a is used for disconnecting the riser 40 from the lower blowout preventer 42. In one embodiment, the lower blowout preventer 42 may be a 13⅝ inch diameter conventional blowout preventer. A subsea wellhead 28 with a slim internal diameter may be cemented into the seabed. In one embodiment, it may have an 18¾ inch inside diameter.

One application for the ship 10 may be the situation where there is an initial, uncontrolled flow of hydrocarbons through the main drilling center 14, including a blowout, with the well finally contained by closing in the well at the RAMs on the independently controlled subsea shutoff assembly 27. In this worse case scenario, the riser 24 cannot be released from the blowout preventer 26 due to the total failure of the controls cable and acoustic release device on the blowout preventer 26 and independent release of the LMRP 27a between the BOP 26 and SSA 27. In this situation, it is necessary to control the release of the riser 24 just above the LMRP 26a by activating the mechanical override riser disconnect 25, as indicated in Figure 5. The situation shown in Figure 5 would be one example where drilling a relief well would be required to control internal pressures of the well or to control uncontrolled

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flow of hydrocarbons from the well in the subsea surface environment because of external blowout.

Thus, as shown in Figure 4, the relief well may be drilled utilizing the same ship 10. Initially, the drilling ship 10 is moved to locate the secondary drilling center 12 aligned over a relief well surface location. The relief well may be spuded, utilizing the secondary well center 12. With conductor and surface pipe run and cemented, the subsea blowout preventer and riser configuration shown in Figure 4 may be run. Then, the subsea blowout preventer and riser system and tensioners 38 may be hung off and tensioned and the telescopic joint extended to the well center 12. Then the relief well may be drilled from the secondary well center.

In some embodiments, the main drilling center and the secondary drilling center may carry 5000 feet of riser at each center. This is sufficient riser length for drilling in many offshore regions, including the arctic, where the maximum depth is about 3500 feet.

References throughout this specification to "one embodiment" or "an embodiment" mean that a particular feature, a structure, or characteristic described in connection with the embodiment is included in at least one implementation encompassed within the present invention. Thus, appearances off the phrase "one embodiment" or "in an embodiment" are not necessarily referring to the same embodiment. Furthermore, the particular features, structures, or characteristics may be instituted in other suitable forms other than the particular embodiment illustrated and all such forms may be encompassed within the claims of the present application.

While the present invention has been described with respect to a limited number of embodiments, those skilled in the art will appreciate numerous modifications and variations therefrom. It is intended that the appended claims cover all such modifications and variations as fall within the true spirit and scope of this present invention.

Throughout this specification and the claims which follow, unless the context requires otherwise, the word "comprise", and variations such as

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"comprises" and "comprising", will be understood to imply the inclusion of a stated integer or step or group of integers or steps but not the exclusion of any other integer or step or group of integers or steps.

The reference in this specification to any prior publication (or information derived from it), or to any matter which is known, is not, and should not be taken as an acknowledgment or admission or any form of suggestion that that prior publication (or information derived from it) or known matter forms part of the common general knowledge in the field of endeavour to which this specification relates.

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THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. A method comprising:

outfitting a drilling ship with two separate and distinct drilling centers, for drilling two different wells, one with each drilling center; and

providing marine risers for each of said drilling centers, the marine risers for one of the drilling centers being of a smaller diameter than the marine risers for the other of said drilling centers; and

providing equipment to enable a relief well to be drilled from the same ship that drilled a failed well.

2. The method of claim 1, including providing storage for marine risers in association with each of said drilling centers.

3. The method of claim 1 or claim 2, including, in association with a secondary drilling center having smaller diameter risers, providing two blowout preventers.

4. The method of claim 3, including permanently installing riser tensioners on said secondary drilling center.

5. The method of any one of the preceding claims, including connecting risers to a lower blowout preventer using a lower marine riser package.

6. The method of claim 5, including providing an upper blowout preventer between said tensioner and said risers.

7. The method of claim 3, including providing a lower marine riser package between a blowout preventer on said secondary drilling center and said risers.

8. The method of any one of the preceding claims, including providing a mechanical override emergency riser disconnector on the drilling center with larger

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diameter risers.

9. The method of claim 8, including connecting the disconnector to a lower marine riser package.

10. The method of any one of the preceding claims, including providing a subsea shutoff assembly for the drilling center with the larger diameter risers.

11. A drilling ship comprising:

a first drilling center to drill a first well, said first drilling center including storage to store first marine risers; and

a second drilling center to drill a second well from the same ship, the second drilling center including storage to store second marine risers, said second marine risers having a smaller diameter than said first marine risers, the ship enabling a relief well to be drilled from said second drilling center when a well drilled from said first drilling center has failed.

12. The ship of claim 11, including two blowout preventers for said second drilling center.

13. The ship of claim 12, including a riser tensioner permanently installed on said second drilling center.

14. The ship of claim 12, including a lower blowout preventer connected to the marine risers via a lower marine riser package.

15. The ship of claim 14, including an upper blowout preventer between said tensioner and said risers.

16. The ship of claim 12, including a lower marine riser package between a blowout preventer on said second drilling center and said risers.

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17. The ship of any one of claims 11 to 16, including a mechanical override emergency riser disconnector on the second drilling center.

18. The ship of claim 17, including said disconnector connected to a lower marine riser package.

19. The ship of any one of claims 11 to 18, wherein said second drilling center includes two blowout preventers and said first drilling center includes only one blowout preventer.

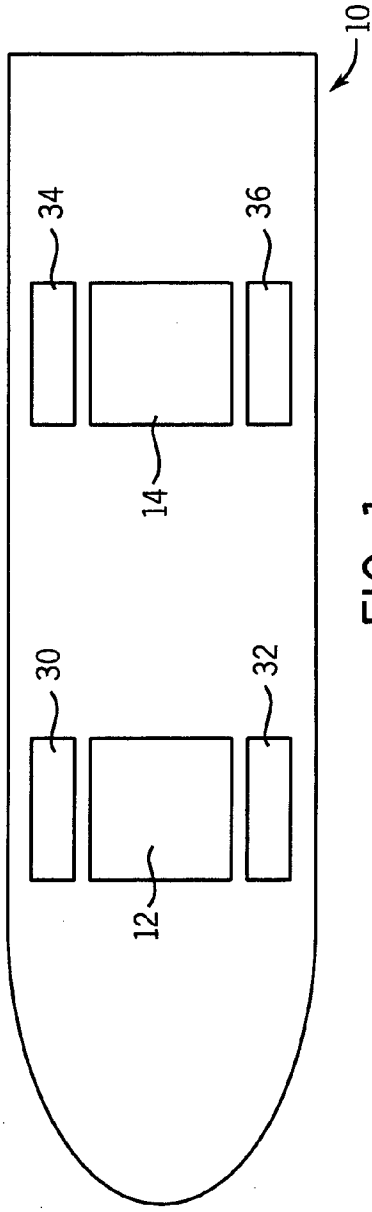

FIG. 1

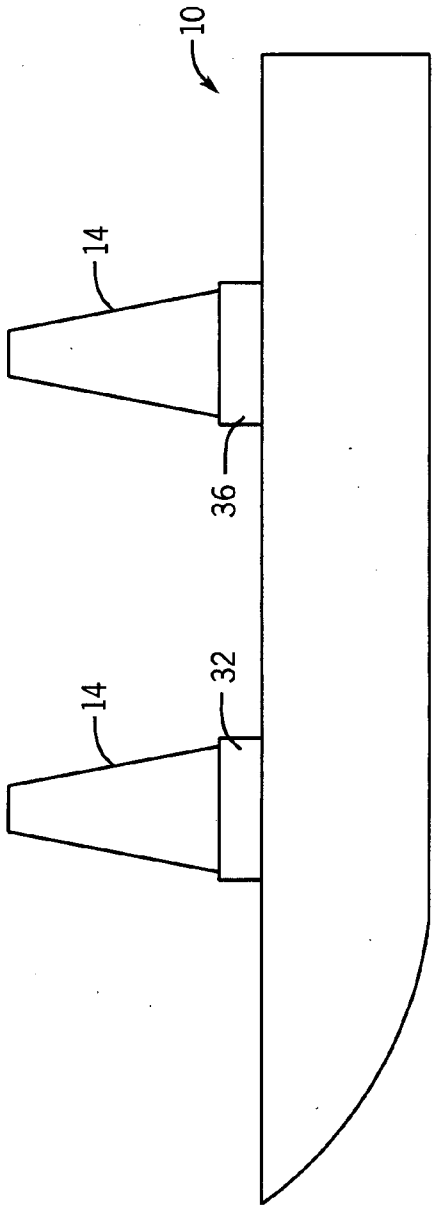

FIG. 2

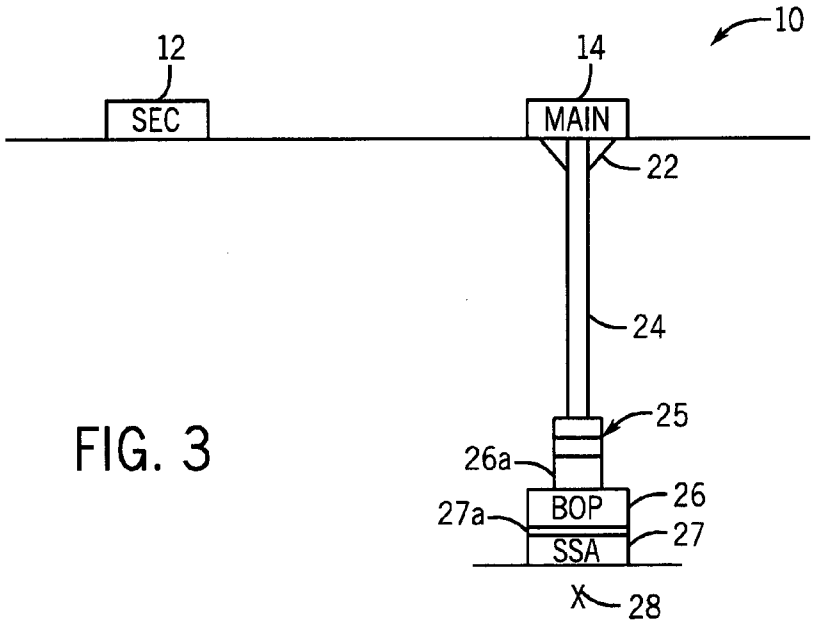
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FIG. 3

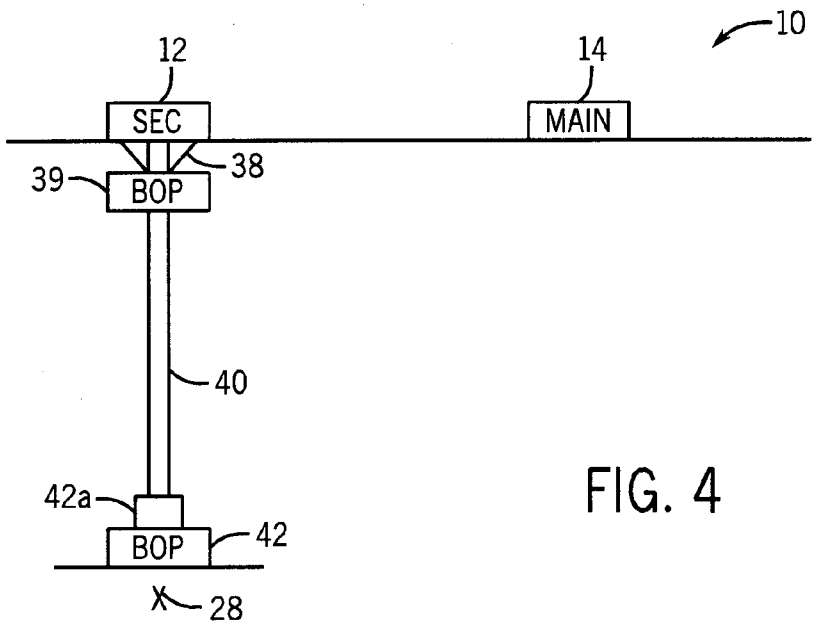
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FIG. 4

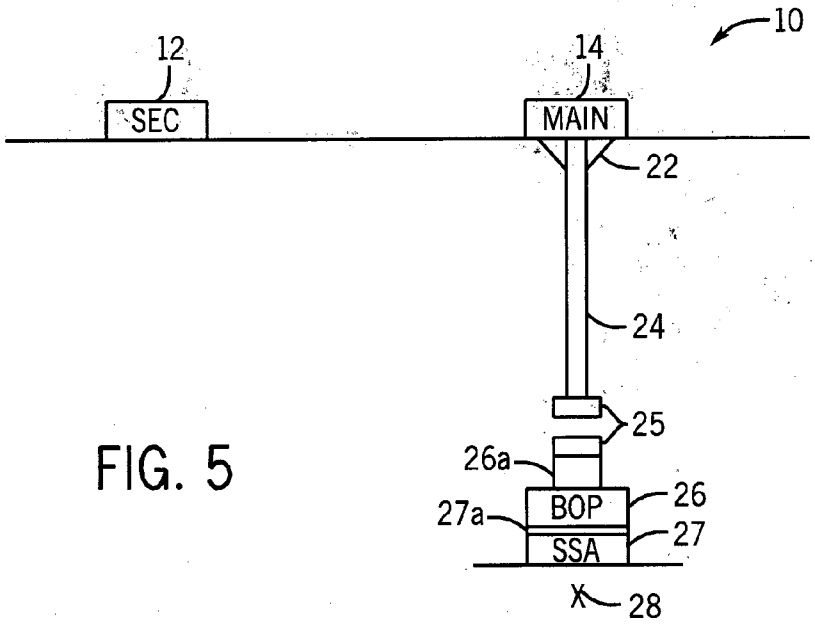

FIG. 5