

United States Patent

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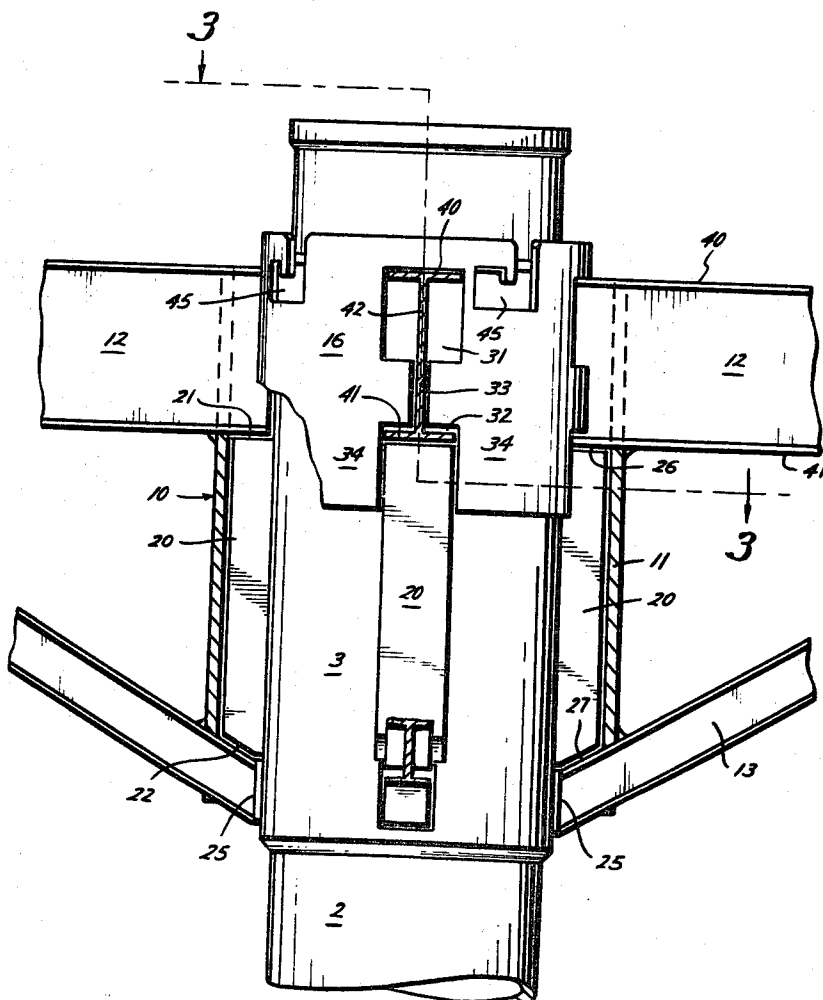
- [54] REMOVABLE GUIDE BASE**
19 Claims, 4 Drawing Figs.

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E21b 7/00 |
| [50] | Field of Search..... | 166/5, .6;
175/5.7 |

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ABSTRACT: A removable guide base for an underwater wellhead comprising a hub member having a vertical passage therethrough telescopically positionable around a wellhead. Structural support members project radially outward and slightly inward of the hub member. An upper set of the inner projections provides a downwardly facing support surface engageable with support ribs on the wellhead. A lower set of the inner projections provides an upwardly facing surface engageable with the wellhead support ribs to prevent longitudinal movement of the guide base relative to the wellhead. The lower set of inner projections is slidable between the wellhead support ribs and rotatable thereunder to the position of engagement as the hub member is lowered around the wellhead and rotated. A latch sleeve is nonrotatingly mounted within the hub member for longitudinal movement between adjacent wellhead ribs to prevent disengagement of the lower set of inner projections. Methods for using the guide base are also disclosed.



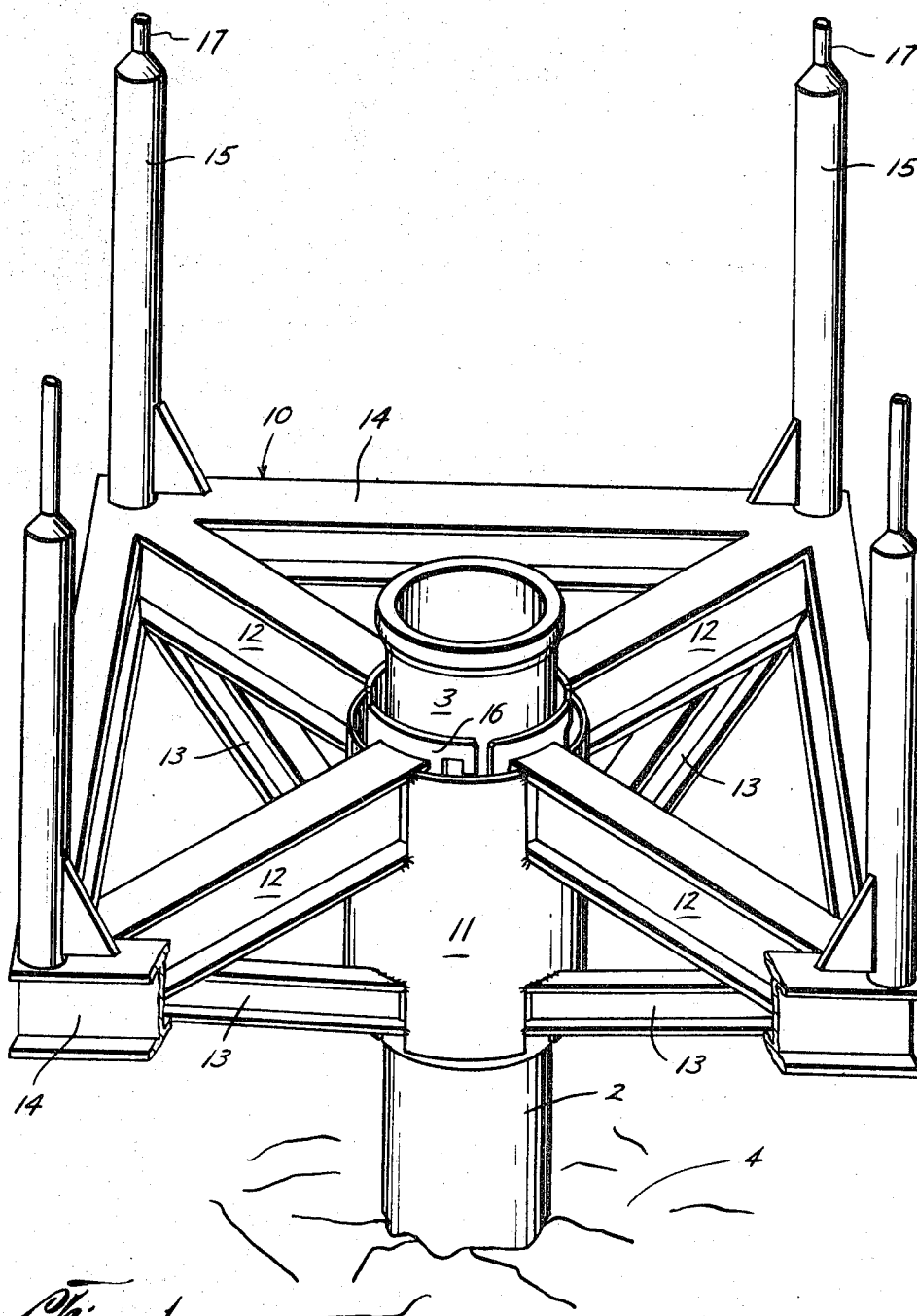


Fig. 1

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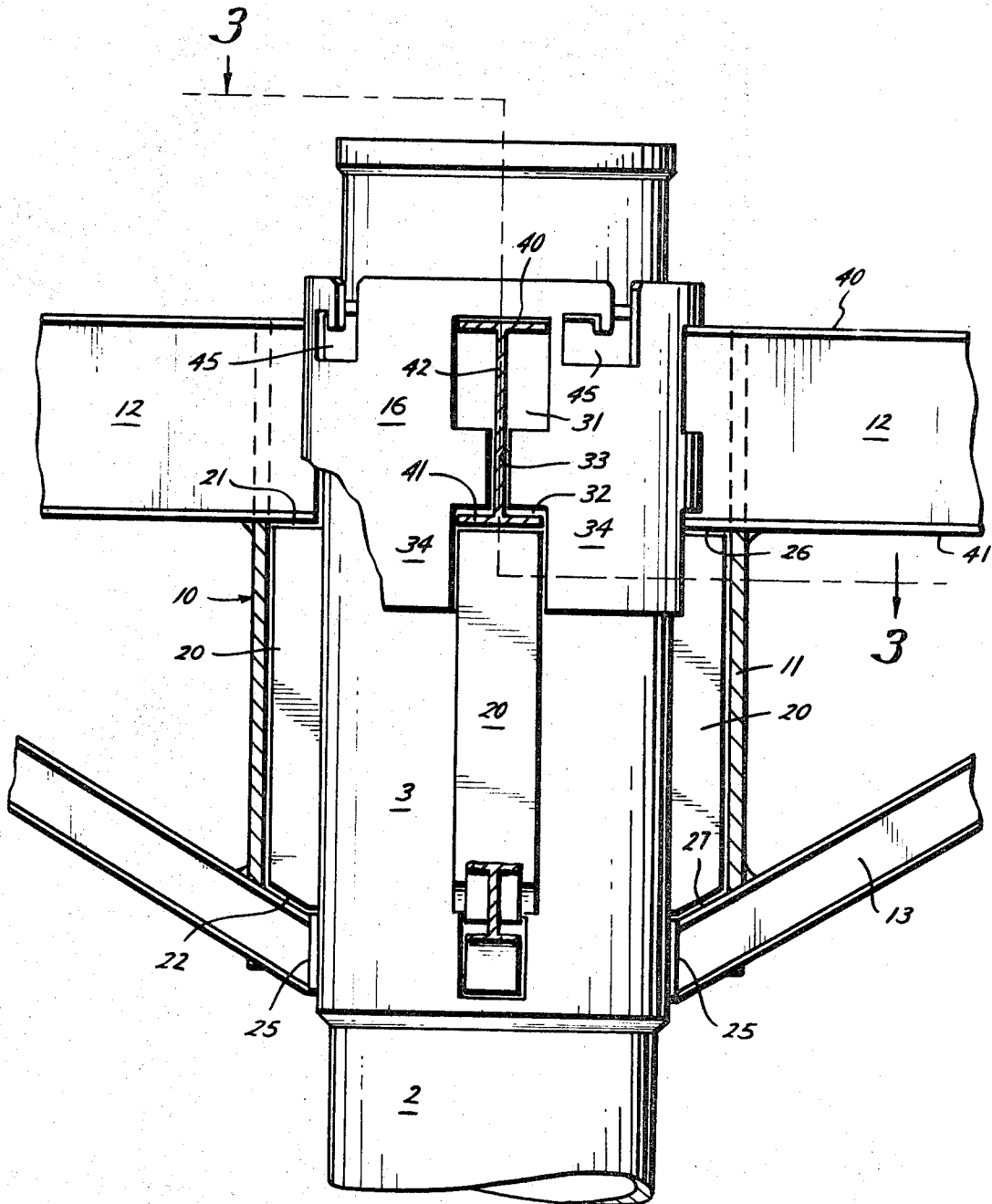
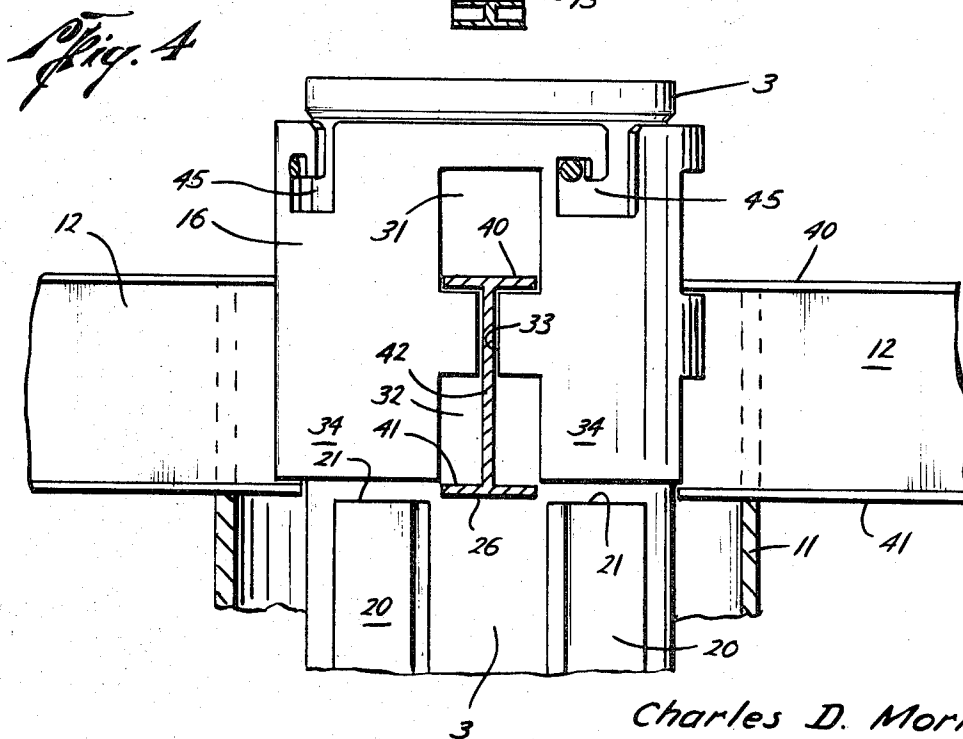
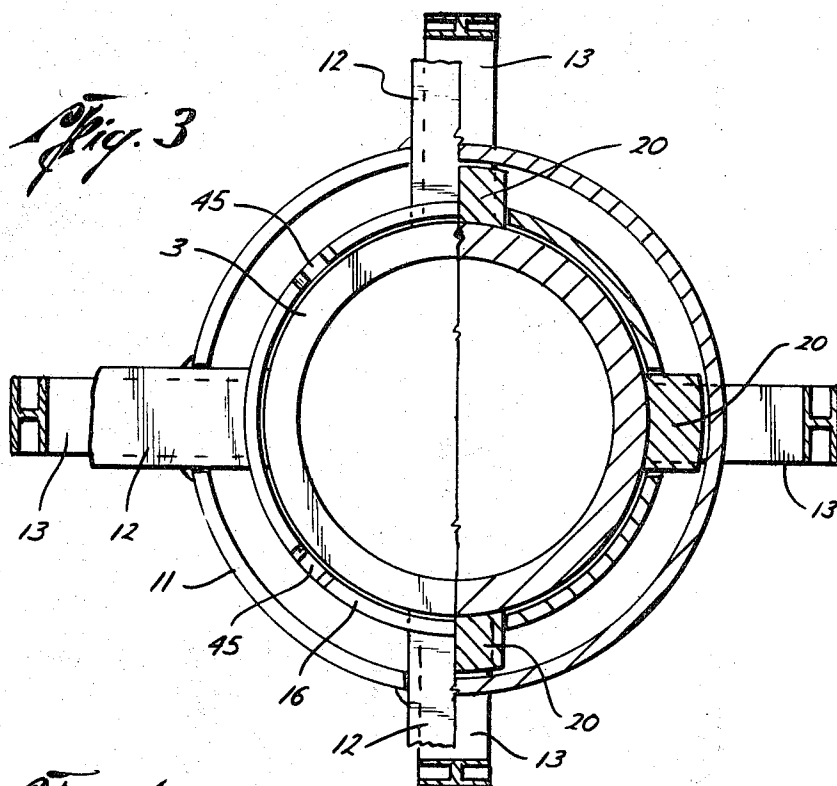


Fig. 2

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REMOVABLE GUIDE BASE

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention is related to offshore drilling and production of petroleum deposits. More specifically it is concerned with methods and apparatus for completing a well at the floor of a body of water.

2. Description of the Prior Art

The increased activity in offshore drilling of oil and gas wells has resulted in the development of new drilling and completion techniques. In some of these methods a conductor casing, wellhead, and other support equipment are installed at the floor of a body of water. Eventually, after drilling, an underwater production tree is installed and flowlines attached thereto for moving production to a storage location. In a method of subsurface completion, it is necessary to have a guide base for guiding equipment from above the water to its proper position underwater. In the past this has usually been accomplished by welding a guide base to the conductor casing before the casing is installed. This usually results in the guide base being permanently installed and unrecoverable even though the well may be a dry hole. Furthermore, in some cases, a well may be temporarily abandoned for later completion leaving an unusable guide base affixed thereto. Since the guide base is a relatively expensive piece of equipment this is an undesirable situation.

SUMMARY OF THE INVENTION

The present invention concerns a guide base and methods of use which allows removal of the guide base from an underwater well and even permits subsequent reinstallation. One method comprises the steps of: installing a conductor casing and wellhead assembly on the floor of a body of water with a removable guide base attached thereto; completing drilling operations; and remotely disconnecting and removing the guide base from the conductor casing and wellhead assembly. The guide base comprises a hub member having a vertical passage therethrough telescopically positionable around an underwater wellhead; structural members projecting a radially outward of the hub member; guide members attached to the structural members for extending upwardly therefrom to the surface of the water body; support means around the interior of the hub member cooperating with the well head to support the guide base thereon; and holddown means around the interior of the hub means positionable on consecutive longitudinal movement and rotation of the hub means relative to the wellhead to engage a portion of the wellhead for preventing longitudinal movement of the guide base.

Exterior support ribs are provided on the wellhead. The inner ends of the structural members project through the hub member. Some of the structural member projections rest on the support ribs and some are disposed directly under the support ribs so that in addition to being supported on the ribs the guide base is also held down by the ribs.

It is understandable that if the hub and support members were rotated they would be free to slide upwardly for release from the wellhead. To prevent such premature action a latch sleeve is provided a portion of which in its lower position lies between adjacent support ribs preventing rotation of the guide hub. To remove the guide base the sleeve is pulled upwardly by a special tool to release the hub for rotation. Should it be desired to reinstall the guide base the reverse procedure would be followed.

BRIEF DESCRIPTION OF THE DRAWINGS

Further objects and advantages of the invention will become apparent from the following description when taken in conjunction with the attached drawings in which:

FIG. 1 is a schematic representation of an underwater well with a removable guide base according to a preferred embodiment of the invention;

FIG. 2 is an elevational view, partially in section, of the wellhead and central portion of the guide base of FIG. 1;

FIG. 3 is a plan view of the wellhead and guide base of FIG. 2 taken along line 3-3 of FIG. 2; and

FIG. 4 is an elevational view similar to FIG. 2 except the latch sleeve is in its upper release position and the guide base is shown rotated 45° out of its support position.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring first to FIG. 1, a conductor casing 2 and attached wellhead 3 are shown anchored at the subsurface 4 of a body of water. Attached to the wellhead 3, in a manner to be more fully described subsequently is a guide base assembly designated generally at 10. The guide base 10 comprises a tubular guide hub 11, radial horizontal structural members 12, inclined structural members 13, bedrails 14, guide columns 15, and latch sleeve 16. Cables 17 are attached to the upper end of columns 15 extending upwardly to the surface of the water (not shown).

The guide base 10 may be attached to the conductor 2 and wellhead 3 for initial installation therewith. Alternatively, it may be attached to the wellhead 3 after the conductor 2 and wellhead 3 have been set and after further drilling operations. It can be removed at any time.

Referring now to FIGS. 1 and 3, a more detailed description will be given. Wellhead 3 is provided with a plurality of longitudinal radially disposed support ribs 20, the upper surface 21 of which may be generally horizontal, the lower surface 22 being downwardly and inwardly inclined. These ribs 20 are used both to support and hold down the removable guide base 10 in a manner which will be more fully understood hereafter.

The tubular guide hub 11 surrounds ribs 20 in a telescopically sliding fit. Horizontal structural members 12 and inclined structural members 13 project inwardly through the walls of hub 11, to which they may be welded to butt up against wellhead 3. A bearing plate 25 such as shown welded to inclined member 13 may also be provided. In the finally installed position, upwardly projecting lower surfaces 26 of horizontal members 12 rest on the upwardly facing surface 21 of ribs 20 and inwardly projecting upper surface 27 of inclined members 13 rest beneath rib lower surfaces 22. Thus, the entire guide base assembly 10 is supported on wellhead 3 and prevented from moving longitudinally with respect thereto.

To obtain this support and holddown position the entire assembly is lowered around the wellhead in an orientation which will permit the inner projections of inclined members 13 to pass between ribs 20. When the assembly 10 has reached the proper elevation, it may be rotated in either direction until the structure members 12, 13 are angularly aligned with corresponding ribs 20.

Latch sleeve 16 is mounted within tubular hub 11 and retained therein for limited longitudinal movement by the inner projections of horizontal structure members 12. Latch sleeve 16 may be easily made from a section of pipe. Rectangular windows 31, 32 connected by slot 33 are cut at intervals corresponding with the placement of structure members 12.

Window 32 opens at the bottom of ring 16 so that depending skirt portions 34 are formed between adjacent lower windows 32. Latch sleeve 16 is free to move upwardly until the lower side of window 31 contacts the lower face of upper flange 40. Its downward movement is stopped when the upper side of window 32 contacts the upper face of lower flange 41. The cooperation of slots 33 and structure member webs 42 prevent rotation of ring 16 with respect to the rest of the guide base. J slots 45 may be provided around the upper rim of latch sleeve 16 for tool engagement. This type of tool engagement is common in the petroleum industry and need not be explained in detail.

Regardless of whether guide base assembly 10 is attached to wellhead 3 before or after it is installed on the water body floor, latch sleeve 16 is usually in the upper or release position shown in FIG. 4. If not, ring 16 will contact upper rib surfaces

21 forcing it to that position anyway. Once the entire assembly is rotated to the support and hold down position of FIGS. 2 and 3 and latch sleeve 16 is released, if it is being held up, it will drop into the lock position shown in FIG. 2. In this position, depending skirt portions 34 lie between adjacent ribs 20 preventing rotation of the guide base assembly 10 relative to wellhead 3. With the guide base in this position, drilling and completion proceeds normally.

Should the well be a dry hole requiring permanent abandonment or should the well be temporarily abandoned for future developments, the guide base assembly may be removed. To do this a tool may be lowered to engage J slots 45 for pulling latch sleeve 16 upwardly to the release position of FIG. 4. Then latch sleeve 16 and consequently all of guide base assembly 10 is rotated until the inner projections of members 12 and 13 disengage the upper and lower faces 21 and 22 of ribs 20. This frees the base 10 for upward movement and removal from the wellhead.

Should it be desired to subsequently reinstall the guide base the reverse procedure would be followed. With proper guide equipment this could be done completely by remote means since latch sleeve 16 would automatically fall between ribs 20 when properly aligned. However, a diver or underwater television camera could also be used to assist in reinstallation when required.

Thus, a simple guide base has been described which may easily be removed from an underwater wellhead for reuse. It may also be installed or reinstalled at the wellhead at a later time.

One embodiment of the invention has been shown in the drawings and described in the specification, but many variations thereof will be apparent to those skilled in the art. It is not practical to show or describe all the variations included within the invention, and therefore the embodiment described should be considered illustrative only, and not limiting, the scope of the invention being as broad as is defined by the appended claims. The form of the claims and the specification, including the abstract, is adopted solely for easier reading and understanding and should not be considered in interpreting the scope of the invention claimed.

I claim:

1. A method of drilling and completing an underwater well comprising the steps of:
installing a conductor casing and wellhead assembly on the floor of a body of water with a removable guide base attached thereto;
completing drilling operations; and
remotely disconnecting and removing said guide base from said conductor casing and wellhead assembly by pulling upwardly on a portion of said removable guide base, without breaking any portion of said guide base, and rotating said guide base less than one revolution to release said guide base for removal from said wellhead assembly.
2. The method as set forth in claim 1 characterized by the further step of permanently abandoning said well.
3. The method as set forth in claim 1 characterized by the further steps of subsequently, remotely reattaching said guide base to said assembly by lowering said guide base around said assembly and rotating said guide base less than one revolution for engagement with said assembly.
4. A method of drilling and completing an underwater well comprising the steps of:
installing a conductor casing and wellhead assembly on the floor of a body of water;
remotely attaching a removable guide base to said assembly by lowering said base around said assembly and rotating said base less than one revolution for engagement with said assembly; and
completing drilling operations, and remotely disconnecting and removing said guide base from said assembly.
5. The method as set forth in claim 4 characterized by the further step of permanently abandoning said well.

6. The method as set forth in claim 4 characterized by the further steps of subsequently, remotely reattaching said guide base to said assembly by lowering said base around said assembly and rotating said base less than one revolution.

7. A guide base remotely removable from a wellhead located on the floor of a body of water comprising:

- hub means having a vertical passage therethrough telescopically positionable around said wellhead;
- structural members projecting radially outward of said hub member;
- guide members attached to said structural members for extending upwardly therefrom to the surface of said body of water;
- support means around the interior of said hub means cooperating with said wellhead to support said guide base thereon; and
- holddown means around the interior of said hub means positionable on consecutive longitudinal movement and rotation of said hub means less than one revolution about the axis of said wellhead to engage a portion of said wellhead for preventing longitudinal movement of said guide base.

8. The guide base according to claim 7 characterized by latch means angularly fixed relative to said hub means engageable with a portion of said wellhead only after engagement of said holddown means to prevent disengagement of said holddown means.

9. The guide base according to claim 8 characterized in that said latch means comprises a tubular sleeve concentrically mounted within said hub member for limited longitudinal movement from said engagement with a portion of said wellhead to release position permitting rotation and longitudinal movement of said hub relative to said wellhead for removal of said guide base.

10. An underwater well guide base for remotely disconnecting from a conductor and wellhead assembly located on the floor of a body of water comprising:

- tubular hub means surrounding a portion of said assembly;
- a plurality of structural support means projecting radially outward from said hub means;
- a downwardly facing surface projecting inwardly of said hub means engageable with a portion of said assembly to support said guide base thereon; and
- an upwardly facing surface, longitudinally displaced from said downwardly facing surface, projecting inwardly of said hub means engageable with a portion of said assembly to prevent longitudinal movement of said guide base, said upwardly facing surface being disengageable with said assembly portion on partial rotation of said guide base relative to said assembly allowing removal of said guide base.

11. The underwater well guide base as set forth in claim 10 characterized by latch means attached to said guide base and adapted to engage a portion of said assembly to prevent said partial rotation of said guide base, said latch being remotely movable to a position whereby said partial rotation is permitted to allow said guide base removal.

12. The underwater well guide base as set forth in claim 11 characterized in that said latch means is mounted within said hub means for limited longitudinal movement from said engagement position to said rotation permitting position.

13. An underwater wellhead and guide base assembly comprising:

- a tubular wellhead means attached to a casing near the floor of a body of water, said tubular wellhead means having longitudinal ribs radially disposed around its exterior, said ribs having an upwardly facing support surface and a downwardly facing holddown surface thereon;
- tubular hub means telescopically positionable around said wellhead means;
- structural support members projecting radially outward from said hub means with guide cables extending upwardly therefrom to the surface of said body of water;

first inner projections radially disposed around the interior of said hub means having a downwardly facing surface engageable with said rib support surfaces; and

second inner projections radially disposed around said hub means interior longitudinally displaced from said first inner projections, upwardly facing surfaces on said second inner projections engageable with said rib hold-down surface; and

said first and second inner projections cooperating with said ribs to prevent longitudinal of said hub when said hub and wellhead are in a predetermined angular relationship.

14. An underwater wellhead and guide base assembly according to claim 13 characterized by latch means angularly fixed relative to said hub means, a portion of said latch means being insertable between said wellhead ribs, only when said sleeve and wellhead are in said predetermined angular relationship, to prevent disengagement of said sleeve and wellhead.

15. An underwater wellhead and guide base assembly according to claim 14 characterized in that said latch means comprises a tubular member mounted between said hub means and said wellhead means for limited longitudinal movement, said insertable portion comprising downwardly depending skirt means, said skirt means being retractable from between said ribs to permit rotation and removal of said sleeve means relative to said wellhead means.

16. An underwater wellhead and guide base assembly as set forth in claim 13 characterized in that said first and second inner projections comprise extensions of said structural support members passing through the wall of said hub means.

17. An underwater wellhead and guide base assembly as set forth in claim 16 characterized in that said structural support members comprise at least two sets of said members, a said first inner projections being the said extensions of one of said sets and said second inner projections being the said exten-

sions of another of said sets.

18. An underwater wellhead and guide base assembly as set forth in claim 17 characterized by a latch means comprising a tubular sleeve concentrically mounted between said hub means and said wellhead for limited longitudinal movement in a fixed angular relationship with said hub means, a portion of said tubular sleeve being positionable between adjacent said ribs only when said inner projections are in said engaging positions to prevent rotation and removal of said sleeve relative to said wellheads.

19. A detachable underwater wellhead and guide base assembly comprising:

a tubular wellhead having a plurality of longitudinal ribs radially disposed around the exterior thereof, said ribs having an upwardly facing holddown surface;

hub means having a vertical passage therethrough telescopically positionable around said wellhead and said ribs;

structural members radially projecting outwardly and inwardly of said hub means providing a downwardly facing surface on the interior of said hub means cooperating with said rib support surface to support said hub means on said wellhead and providing an upwardly facing surface engageable with said rib holddown surface to prevent longitudinal movement of said guide base relative to said wellhead, said upwardly facing surface being disengageable on rotation of said hub means to permit upward movement and release of said hub means relative to said wellhead; and

tubular latch sleeve mounted within said hub means for limited longitudinal movement having a portion thereof slidably positionable between adjacent said wellhead ribs to prevent said disengagement of said structural member upwardly facing surface.

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