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WELLHEAD ASSEMBLY TO AID RELOCATION OF SUBSEA WELLS

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Fig. 1

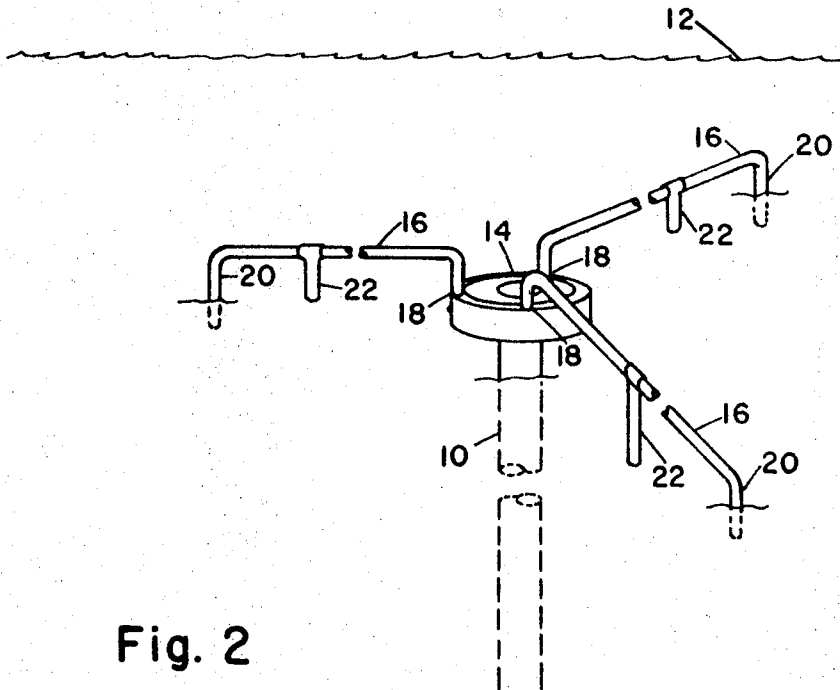
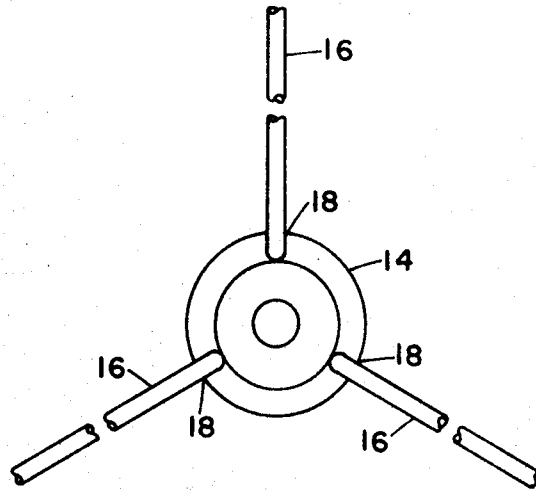


Fig. 2

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1

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WELLHEAD ASSEMBLY TO AID RELOCATION OF SUBSEA WELLS

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5 Claims

ABSTRACT OF THE DISCLOSURE

A mechanical assembly for attachment to a subsea wellhead to enhance the magnetic anomaly in the vicinity of the well. The assembly includes a collar connected to the wellhead and a number of arms extending horizontally outward from the collar. The arms are constructed of a ferromagnetic material or include permanent magnets attached to them.

BACKGROUND OF THE INVENTION

When subsea oil and gas wells are temporarily abandoned, it may be desired to relocate them at a later date. For example, when a gas well is discovered is may be desirable to cap the well and return to produce the gas at a more favorable time. The easiest technique for relocating an abandoned subsea well requires leaving some equipment, such as a buoy, projecting above the water surface to mark the location of a well. For various reasons, temporarily abandoned subsea well heads may not have any equipment projecting above the water surface to permit easy relocation. Governmental regulations may prescribe that a subsea wellhead not project above the sea floor to prevent interference with shipping or fishing.

The state of the art for relocating abandoned subsea wellheads includes (1) searching by radio ranging techniques (sonar), (2) dragging a cable across the sea floor to intercept a projecting wellhead, (3) visual sighting by divers, and (4) attaching an acoustic pulsing device or "pinger" to the wellhead and listening for the characteristic pulse pattern of the pinger. If an abandoned subsea wellhead is flush with or below the sea floor, it may be very difficult even for a diver in the immediate vicinity of the wellhead to spot it—particularly if the water is murky. Sand on the sea floor may shift so that a subsea wellhead previously flush with the sea floor becomes buried. The pulses emitted by acoustic devices cannot be detected successfully at large distances when the well is buried. Furthermore, acoustic devices or any devices requiring an active element are not inherently failproof because of the problems of corrosion, loss of battery life, and malfunctions of circuitry and instruments. Underwater type batteries rarely have a useful life of more than two years.

A truly failproof technique to aid in relocating a temporarily abandoned well is by magnetic methods. The magnetic technique involves searching with a magnetometer for the magnetic anomaly created by the ferromagnetic material in a subsea well. The magnetic techniques may be used as alternative or secondary methods after the primary methods, such as the sonic devices, fail. Usually, radio or celestial navigational aids can pinpoint the location of the well within a few miles. It remains for other techniques to be employed to pinpoint the well within a defined search area.

In our patent application, Ser. No. 763,713, filed Sept. 30, 1968, there is described a method to aid relocation of a subsea well by depositing permanent magnets in an array pattern surrounding the well.

2

SUMMARY OF THE INVENTION

The present invention provides still another means to aid relocation of a temporarily abandoned subsea well. This invention is a novel mechanical assembly for attachment to a subsea wellhead to enhance the magnetic anomaly in the vicinity of the well. The assembly includes a collar attached to the wellhead and a number of arms extending horizontally outward from the collar. The arms include a magnetic material which generates a magnetic field. The outer ends of each of the arms include a downwardly extending portion which engages the sea floor. The length of the arms may vary from 20–50 feet or more, the longer the arms and the more of them the greater the enhancement of magnetic anomaly.

The assembly is particularly designed for wellheads which are flush with or slightly above the sea floor. The assembly will not interfere with shipping or fishing because the downwardly extending outer end portions of each of the arms in the assembly prevent objects such as fish nets from becoming snagged.

BRIEF DESCRIPTION OF THE DRAWINGS

Further details of the invention will be described for a specific mechanical form with reference to the accompanying drawing in which:

FIG. 1 is a top view of the well head assembly; and

FIG. 2 is a perspective view of the assembly attached to a subsea wellhead.

DETAILED DESCRIPTION OF THE DRAWINGS

Referring to FIGS. 1 and 2, a wellbore 10 is shown penetrating through the sea floor 12. Attached to the top of well 10 is a collar 14 which may surround the normal wellhead equipment of a subsea well. Extending horizontally outward from collar 14 are a number of arms 16 which include a magnetic material. Vertical segments of arms 16 are shown attached to collar 14 at joints 18.

The outer ends of arms 16 have a downwardly extending portion 20, which engages the sea floor 12 and supports arms 16 above the sea floor. Downwardly extending portion 20 prevents fish nets or other objects from becoming snagged on the outer ends of arms 16.

Intermediate the ends of arms 16 is shown a support 22 tied to each of the arms and extending to the sea floor 12.

After being installed for a period of time, the arms 16 of the wellhead assembly will become magnetic under the influence of the earth's magnetic field, thereby producing a large magnetic anomaly in the vicinity of the well.

The wellhead assembly as described above is simple and can be manufactured on location at the well site, usually from scrap materials. For example, collar 14 may be manufactured from damaged drill pipe or casing. The arms 16 may be manufactured from drill pipe or casing and are preferably 15 inches in outside diameter or larger. The length of arms 16 may be on the order of 60 feet. Where permitted by government regulations, the arms 16 are preferably raised above the sea floor on the order of four feet.

The arms 16 may be constructed entirely of a ferromagnetic material such as steel pipe or have permanent magnets attached to them. Permanent magnets of a ceramic material have the advantage of low cost, permanency of magnetism, and resistance to corrosion.

Various magnetic techniques may be used to relocate the well marked by the wellhead assembly. Commercial magnetometer services are offered by various contractors such as Oceanics, Inc., Morgan City, La.

While three arms have been shown in the wellhead assembly, it will of course be obvious that other numbers

3

of arms may be employed. Furthermore, a specific mechanical form of the wellhead assembly has been illustrated and described, but it will of course be understood that such other forms as fall within the scope of the appended claims are intended to be included.

The invention claimed is:

1. A wellhead assembly for a subsea wellhead comprising a collar attached to the wellhead and a number of arms extending horizontally outward from said collar, said arms including a magnetic material, the outer ends of each of said arms having a downwardly extending portion which engages the sea floor, whereby said assembly enhances the magnetic anomaly in the vicinity of the well and facilitates relocation of the wellhead.

2. A wellhead assembly as defined by claim 1 further including supporting means intermediate the ends of each of the arms for supporting the arms above the sea floor.

3. A wellhead assembly as defined by claim 1 in which the arms are comprised of ferromagnetic pipe.

4. A wellhead assembly for a subsea wellhead for enhancing the magnetic anomaly in the vicinity of the well-

4

head to aid in relocation thereof, said assembly comprising:

a collar adapted to be connected to the subsea wellhead; and

a plurality of arms attached to said collar, said arms including a magnetic material and extending substantially radially outward therefrom so that the outer ends of said arm are spaced from said wellhead.

5. The assembly of claim 4 wherein said arms extend outward from said collar for a distance greater than 20 feet.

References Cited

UNITED STATES PATENTS

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G. HARRIS, Primary Examiner

U.S. Cl. X.R.

166—65; 175—40