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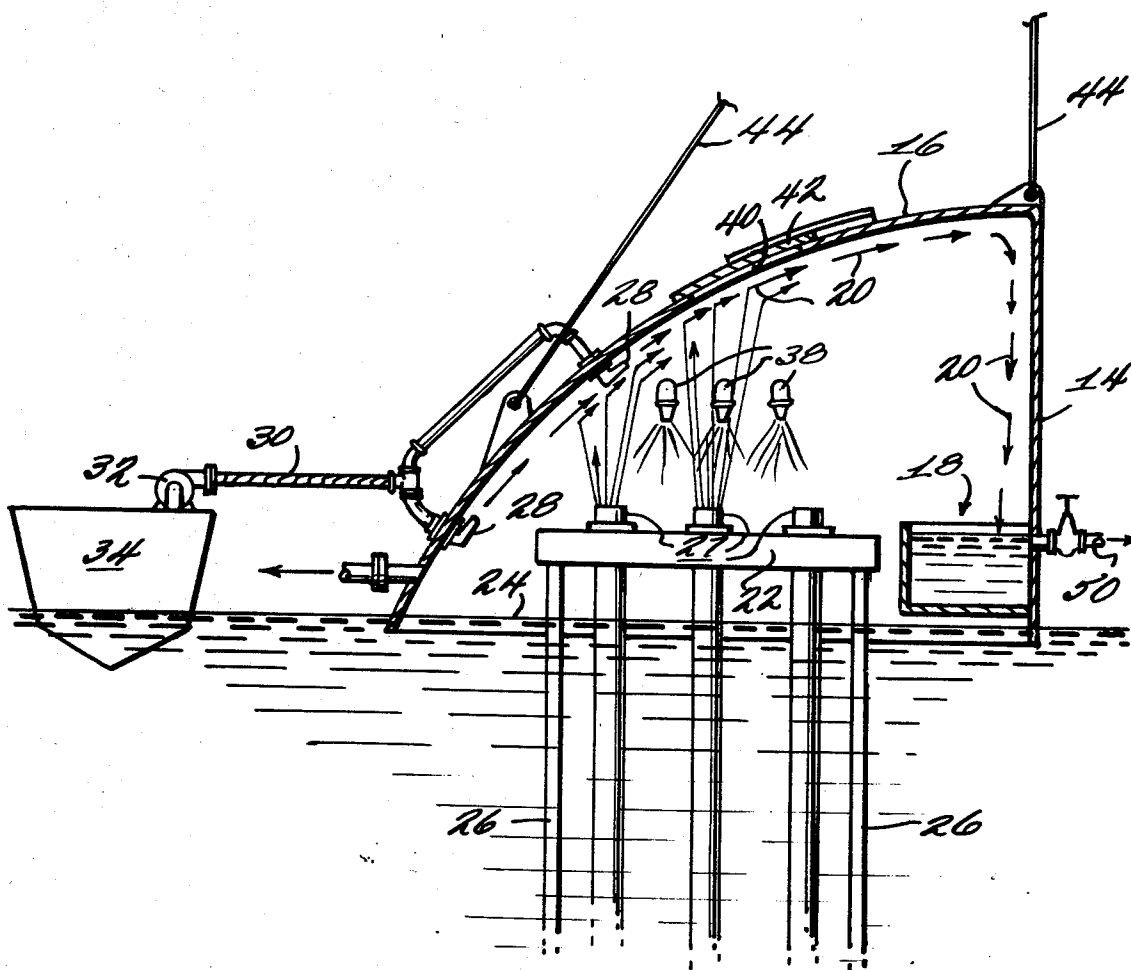
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[54] **OIL POLLUTION CONTROL AND FIRE EXTINGUISHING APPARATUS AND METHOD**
4 Claims, 5 Drawing Figs.

[52] U.S. Cl..... 169/2,
 166/75
 [51] Int. Cl..... A62c 3/00
 [50] Field of Search..... 169/2;
 166/90, 81, 315, 277, 75X

ABSTRACT: A device for extinguishing gas and oil well fires, particularly multiple-well, offshore installations, and for preventing loss of oil to the surrounding area after fire extinction comprises a hood adapted to be placed over the well site, the hood having a curved interior upper wall which deflects the gushing oil into a catch basin from which it can be pumped away.



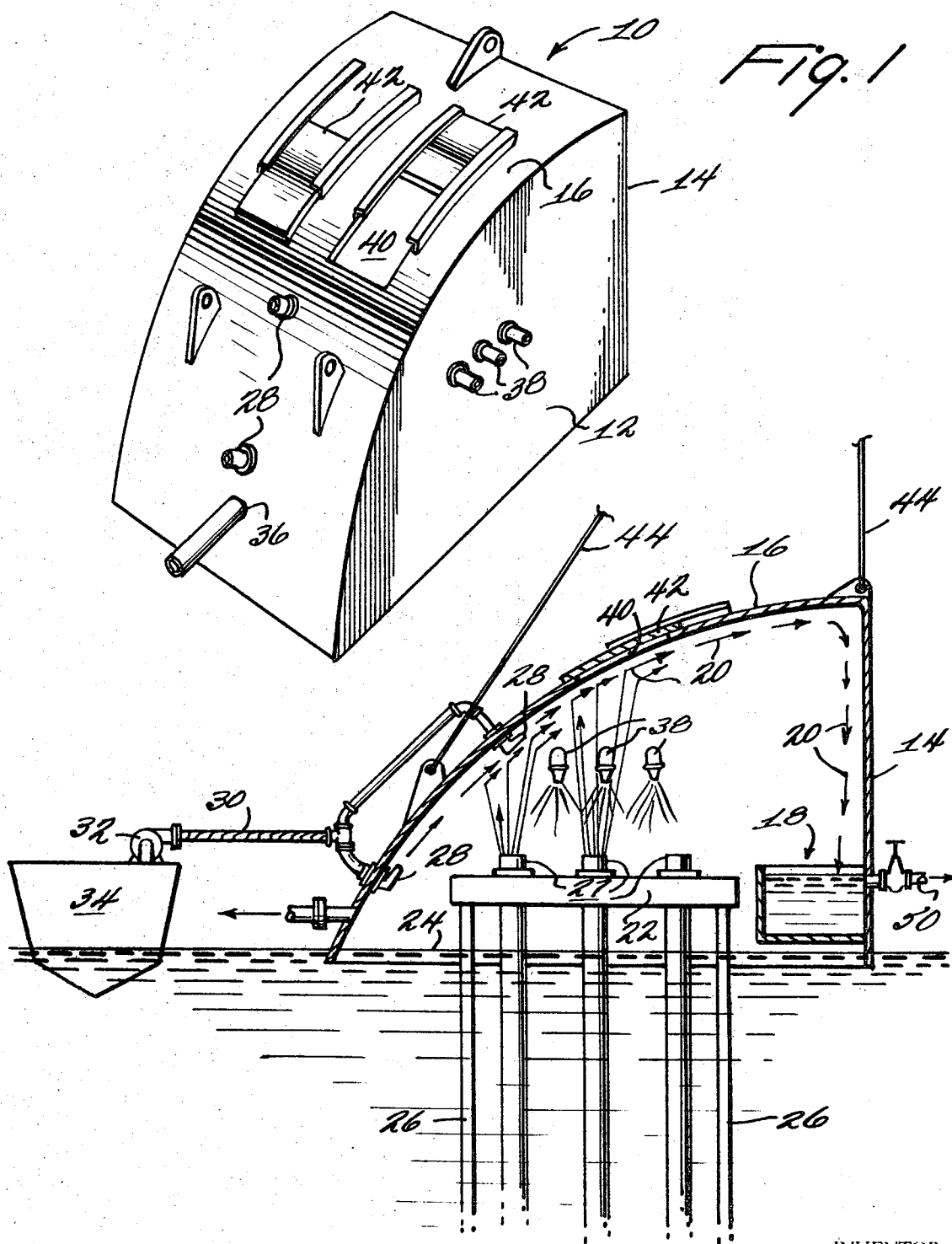


Fig. 2

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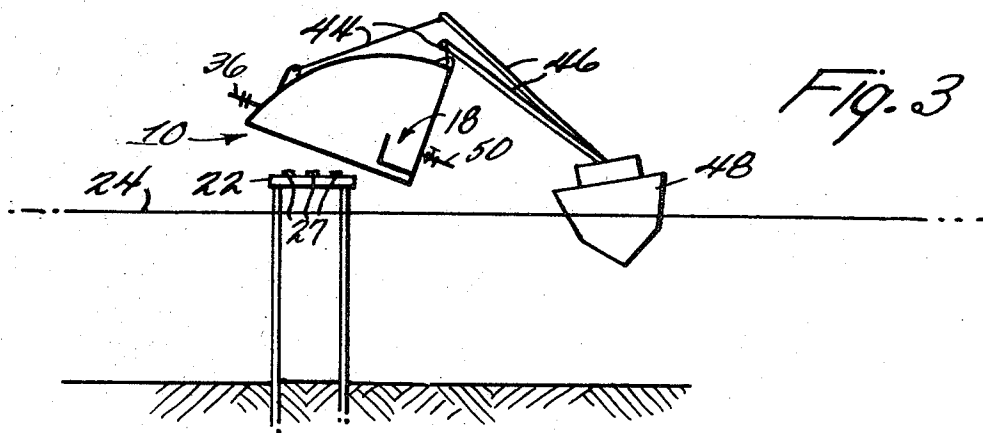


Fig. 3

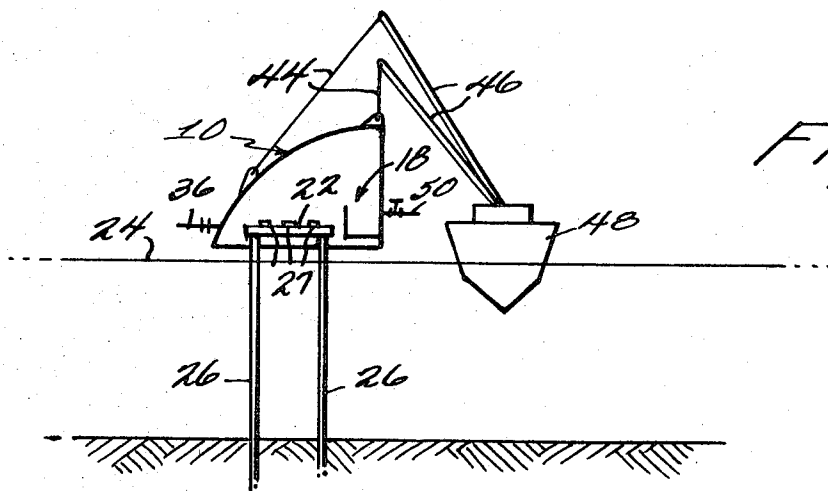


Fig. 4

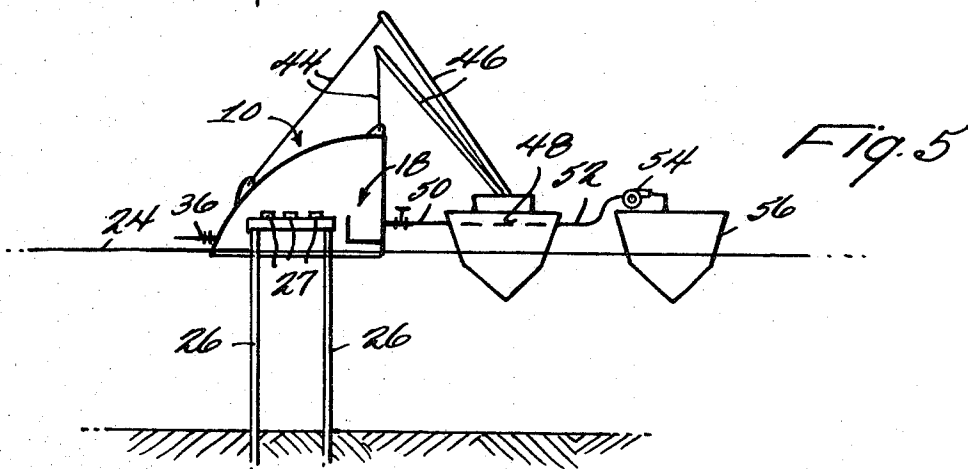


Fig. 5

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OIL POLLUTION CONTROL AND FIRE EXTINGUISHING APPARATUS AND METHOD

DISCLOSURE

This invention relates to a method and apparatus for combatting gas and oil well fires and for collecting and removing oil from the site so as to prevent pollution of the area while oil is still flowing from the well.

Three of the major problems associated with an oil well fire are the difficulties encountered in extinguishing the fire initially, preventing reignition, and preventing pollution of the surrounding area with oil during the period between fire extinction and capping of the well. More specifically, the oil loss problem arises because after the fire has been put out, the oil continues to gush from the broken well head usually under high underground pressure. The flow of oil is stopped only by plugging the well head in some manner, as by lowering a special blowout preventer over the well head. This is often a difficult and time-consuming job due to the danger of reignition and the presence of the spurting oil.

The pollution problem is particularly severe in the case of offshore, multiple-well installations where a plurality of well heads may be disposed on a single large platform. Where an installation of this type catches fire or is otherwise damaged there can be a very high rate of oil loss to the surrounding sea and correspondingly great pollution and destruction of marine life, water fowl and shore areas.

The present invention combats both the fire and the loss of oil in offshore, multiple-well installations. However, the apparatus and techniques have special utility in preventing loss of oil where the broken well head has resulted from physical damage such as from storm or collision or from a fire which has previously been extinguished. According to the principles of the present invention there is provided a special hooklike structure of sufficient size that it can be lowered over the well site so as to overlie the well heads and either fully or partially enclose the entire site, including the platform on which the well heads are located. The hood will of course be of large size and weight and must be transported and manipulated by heavy duty floating cranes of the kind available in the offshore oil well industry. The interior of the special hood presents a downwardly facing generally concave deflecting surface to the spurting oil to direct it into a catch basin or the like within the hood, thereby substantially preventing the oil from dropping into the sea. The collected oil is pumped through one or more pipes to a storage structure such as a barge or other vessel or a land-based tank installation if the well site is close to shore. The upper wall of the hood is provided with one or more hatches or the like through which well-capping operations may be carried out from a floating vessel carrying the necessary equipment. The techniques employed in capping a broken well head are usually the responsibility of an experienced specialist and form no part of the present invention.

The hood may be provided with piping and valving for directing fire extinguishing fluids such as water or drilling mud on to the well site after the hood is in place. There may also be provided piping and valving for directing streams of water at the spurting oil or along the curved deflecting surface to assist in directing the oil toward the catch basin.

If the hood is lowered over the well site to an elevation at which its edges become submerged, it will generally be necessary to provide one or more outlet pipes for venting the gas which often accompanies the oil escaping from the well.

The invention will be further understood from the following more detailed description of an exemplary embodiment illustrated in the drawing in which:

FIG. 1 is a schematic perspective view of a well site enclosure embodying the principles of the present invention;

FIG. 2 is a schematic vertical sectional view of the enclosure of FIG. 1; and

FIGS. 3, 4 and 5 are schematic views illustrating the placing of the enclosure over an offshore well site.

As previously described, the present invention provides an enclosure or hoodlike structure adapted to be lowered into place over an offshore well site by means of equipment available in the offshore oil well industry. Such an enclosure is illustrated schematically at 10 in the drawings, it being understood that the exterior shape of the enclosure is of no great importance. In the illustrated embodiment the enclosure 10 is defined by two spaced-apart vertical side walls 12, a vertical end wall 14 and an inclined top wall 16. The size of the enclosure 10 is such that it will cover the largest well site that it is designed for. For example, a typical offshore platform might be 60 feet square and 60 feet above water level and support 12 well heads. The walls 12, 14 and 16 may be of sufficient thickness to render the enclosure self-supporting, or they may be of thinner construction reinforced with internal or external bracing.

An important feature of the enclosure 10 is that it include an interior oil-deflecting surface capable of deflecting upwardly gushing oil in a lateral direction toward a collecting basin 18. In the illustrated embodiment the inner surface of the top wall 16 provides the deflecting surface. The top wall 16 may be visualized as having the shape of a 45° pipe bend which has been cut longitudinally along its axis. Accordingly, the lower surface of the top wall 16 is concave from its lower end to its upper end and from side-to-side. While it is necessary that the deflecting surface be generally curved from its lower end to its upper end, the illustrated shape is not critical. If desired, the deflecting surface may be defined by a separate structure suitably supported from the walls which define the enclosure 10.

The oil catch basin 18 extends from one side wall 12 to the other and is disposed adjacent the rear wall 14 in a position to catch the oil which has been deflected upwardly and rearwardly by the wall 16, as shown by the arrows 20 in FIG. 2. Also schematically shown in FIG. 2 is an offshore platform 22 supported above the level of the sea 24 by legs 26 and having a plurality of well heads 27 projecting therefrom. As previously described, when a well head has been ruptured or broken oil flows from the head under such pressure that it spurts or gushes to a considerable height. When the enclosure 10 has been placed over the site, the oil will strike the lower deflecting surface of the wall 16.

In order to aid in deflecting the oil along the deflecting surface streams of water may be injected along the surface by means of suitable jets 28. Valved water supply pipes 30 are connectable to a pressurized source of water, such as pumps 32 carried by a service vessel 34 and adapted to draw water from the sea.

It is usually necessary to provide one or more vent pipes, such as shown at 36, for releasing gas from the enclosure 10, since many offshore wells are dual gas-oil wells. Vent pipes are particularly necessary when the enclosure 10 is lowered into contact with the sea thereby preventing escape of gas around the lower edges of the enclosure 10. In use the vent pipe 36 is connected to a long pipe 37 to convey the gas to a remote location where it can be burned. The enclosure 10 may also include pipes 38 for injecting fire extinguishing liquids such as water or drilling mud on to the platform 22. These pipes 38 which may be mounted on the sidewalls 12 can be supplied with the pressurized liquid from pumps on the service vessel 34.

When all the necessary equipment for capping the well heads 12 has been assembled, the capping operation will be carried out through the walls of the enclosure 10, for example through hatches 40 which are fitted with sliding covers 42. As previously explained the capping operation involves the lowering of a blowout preventer assembly over the damaged open end of a well head and operating the assembly to cut off the flow of oil. The assembly and other equipment are brought to the site by the service vessel 34 or other vessel equipped with one or more cranes, and after one of the covers is slid back, the capping operations are effected through the respective hatch 40. The hatches 40 should be relatively small so as

to permit as little oil as possible to escape during the capping operation. The power mechanism for sliding the covers 42 may be carried by the enclosure 10 or by the service vessel.

FIGS. 3, 4 and 5 illustrate a typical sequence of steps by which the enclosure 10 may be placed over the platform 22 5 which for purposes of illustration may be assumed to have one or more spurting well heads but no fire. In FIG. 3 the enclosure is shown suspended by cables 44 and booms 46 carried by a vessel 48. The forward end of the enclosure has been raised above the rear end so as to clear the platform 22. Then the forward end of the enclosure 10 is lowered, as seen in FIG. 4, and the entire enclosure is lowered over the platform 22. In the illustrated embodiment the platform 22 is lowered into contact with the sea 24 although this is not always necessary or even possible. Oil which collects in the basin 18 is carried off 10 through an outlet 50 in the rear wall 14 and through a flexible line 52 by gravity or by means of a pump 54 carried on a barge 56.

If there is an oil fire on the platform 22 the operations shown in FIGS. 3, 4 and 5 will be carried out in a similar manner, except that no attempt to carry off the oil will be made until after the fire has been extinguished by smothering and with the aid of liquids pumped through the pipes 38. These same liquids will also serve to cool the platform 22 to prevent reignition by hot spots.

It will be understood that the location of the hatches 40 may vary from that illustrated and that the enclosure will be moved in horizontal directions by the cables 44 and booms 46 in order to align a given hatch 40 with a desired well head 27.

I claim:

1. Apparatus for use in enveloping an offshore multiple-head oil well site for collecting oil flowing under pressure from one or more damaged well heads and for extinguishing a fire,

said apparatus comprising: a hoodlike structure of sufficient size to cover the well site, said structure having an open bottom permitting the structure to be lowered over the well site and having an upper wall and a side wall for at least partially surrounding the sides of the well site; oil deflecting means within said hoodlike structure including an inclined surface which overlies the well heads at an angle such that oil spurting upwardly from a well head against said surface is deflected laterally; catch basin means within said hoodlike structure disposed to receive the deflected oil; pipe means for carrying away oil from said catch basin means; and hatch means associated with the upper wall of said hoodlike structure through which well-capping operations can be effected from a location outside said structure.

2. Apparatus as in claim 1 including liquid injection means carried by said structure for injecting fire-extinguishing liquids into the interior of said structure.

3. Apparatus as in claim 1 including means carried by said structure for directing a current of water along said inclined surface to assist in deflecting the flow of oil toward said basin means.

4. A method of extinguishing and capping a burning offshore oil well comprising: transporting to the well site an open-bottomed enclosure of sufficient size to envelop the well site; lowering the enclosure over the well site; injecting fire-extinguishing liquid through the enclosure on to the well site to extinguish the flames; deflecting gushing oil from the well site to a retaining structure within said enclosure; pumping oil from the retaining structure to a remote tank; and lowering well-capping equipment from a location outside the enclosure through the enclosure into engagement with a well head and effecting capping of the well head.

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