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Collier

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[54] **REMOVABLE TUBULAR INSERT FOR REDUCING EROSION IN HEADERS**

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[73] Assignee: **Esso Production Research Company,** Houston, Tex.

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[52] **U.S. Cl.** ..... **137/561 A,** 166/91

[51] **Int. Cl.** **F16l 57/00**

[58] **Field of Search** ..... 137/561 R, 561 A, 137/60 A, 375, 263, 266; 138/37, 40; 166/91, 95, 105 A, 157, 167; 302/59, 61

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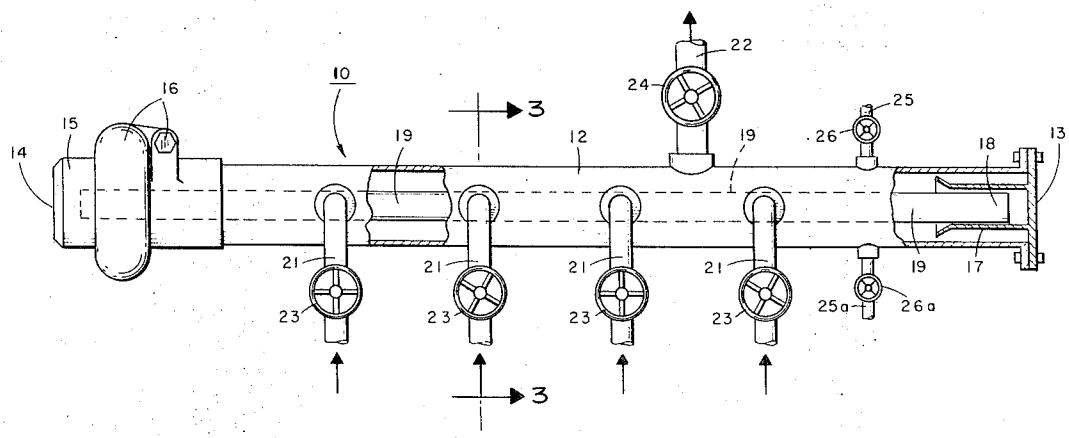
[57] **ABSTRACT**

A production header for sand carrying fluids such as petroleum hydrocarbons is provided with a removable tubular insert extending the length of the header and which is provided with an abrasion resistant surface against which the fluids impinge to absorb the shock and prevent erosion of the inner wall of the header.

9 Claims, 3 Drawing Figures



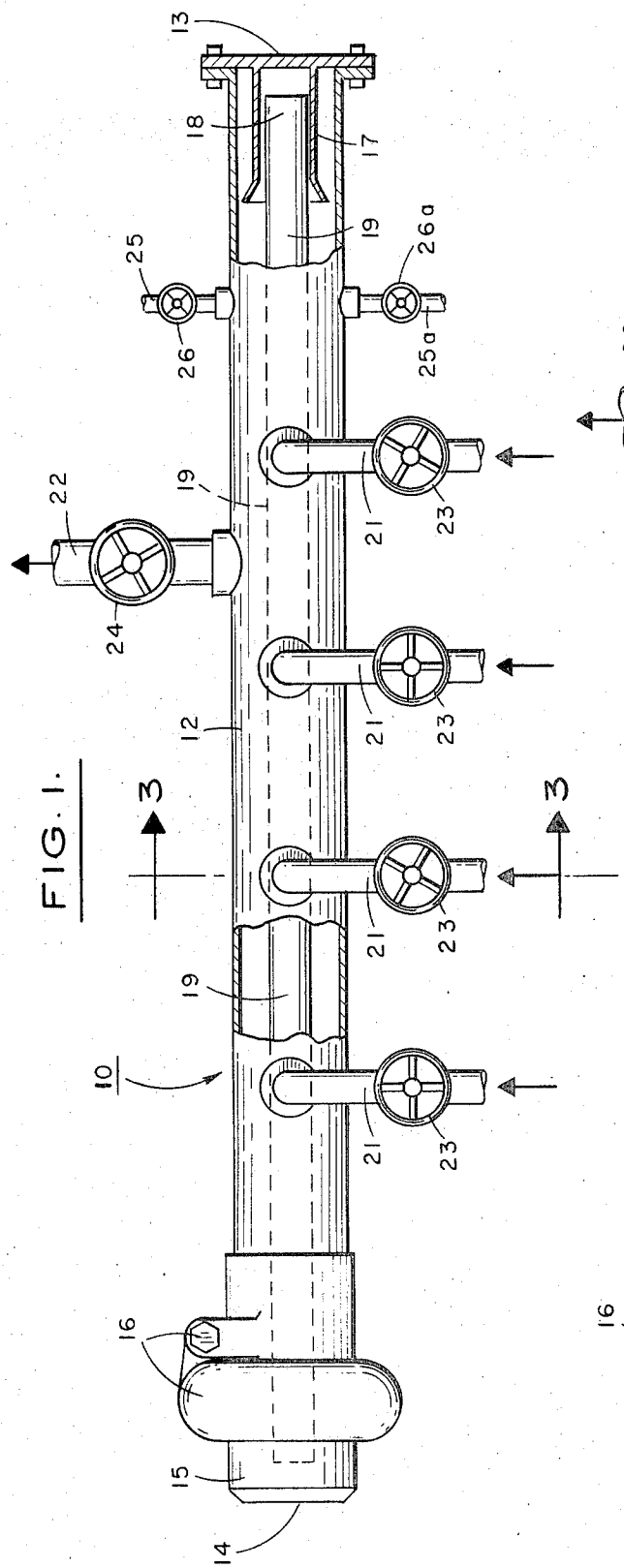


FIG. 1.

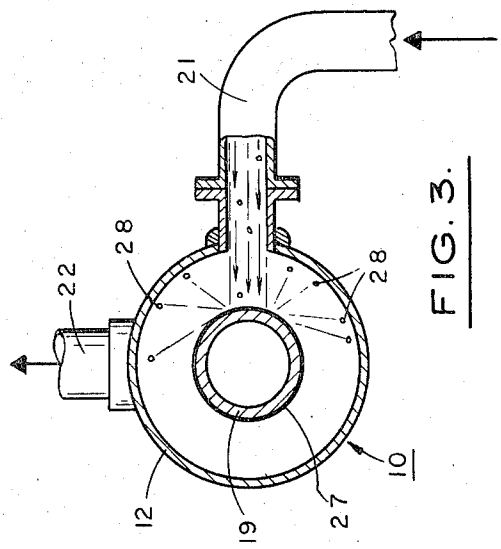


FIG. 3.

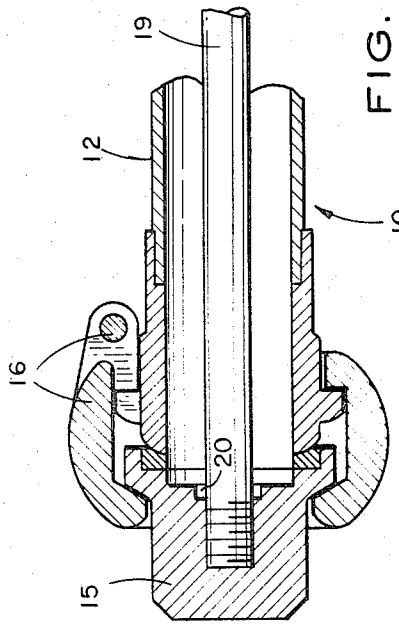


FIG. 2.

REMOVABLE TUBULAR INSERT FOR REDUCING EROSION IN HEADERS

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention is directed to apparatus for carrying abrasive fluid. More particularly, the invention is concerned with a production header for producing fluid hydrocarbons containing abrasives such as sand. In its more specific aspects the invention is directed to a production header for an offshore well in which abrasive materials are produced with fluid hydrocarbons and in which erosion of the production header by the abrasive material is minimized.

2. Description of the Prior Art

A number of proposals have been made to minimize erosion in flow lines or the parts thereof. Thus, various velocity retarding devices have been suggested in sulfuric acid manufacture by impingement of gases on a deflector. Likewise, in a conduit system, stratification of solids carried by a fluid is minimized at turns by employing a means for dividing the conduit in sections. Velocity retarding devices in pipe lines comprise alternating layers of hard metal and soft semi-pliable material against which the fluid impinges or is directed. Fluid flow from wells is caused to impinge against semicircular deflectors and the same principle is used in an expansion head. Sugars and other granular material are conveyed through a conduit against a door actuated by pressure. In pneumatic material handling apparatus depending rubber baffles are adapted to yield and move within a box to absorb shock of fluid against them. Also energy is absorbed from a stream or jet of water flowed against baffles and a perforate tubular member which emits streams of air against the water.

One of the most costly and potentially dangerous offshore operating problems in oil and gas production is sand erosion. The problem occurs when fine-grained formation sand is produced with wellbore fluid. As the direction of flow is changed at the offshore platform, the abrasive sand particles impinge upon a given section of production equipment and gradually erode the surface — often to the point of failure. Although wellhead chokes which are subjected to sand erosion can be removed and inspected on a periodic basis with a minimum amount of effort, production headers into which individual wells are flowed cannot be easily inspected. Although radioactive, acoustic, and electromagnetic surveys are used to inspect such equipment, the effort is costly and provides what is often only a qualitative answer. When headers are found to be near failure and have to be replaced, a substantial expense is incurred and production losses are usually realized. None of the art, however, teaches or makes obvious apparatus for reduction of sand erosion in liquid or gaseous hydrocarbon or other sand-laden gas production headers.

The present invention provides a system which (1) substantially reduces sand erosion in production headers and (2) facilitates replacement of eroded header sections at a minimum cost without welding. The invention also provides access to the inside of the header for visual inspection and measurement of erosion damage.

SUMMARY OF THE INVENTION

The present invention may be briefly described and summarized as involving apparatus suitable for use as a production header such as on an offshore hydrocarbon production platform. The production header is comprised of a hollow elongated member which may be tubular into which is connected one or more flow lines from one or several oil or gas wells. The hydrocarbon fluid usually carries with its fine abrasive particles such as sand which usually quickly abrade or erode the inner wall of the hollow elongated member causing destruction or failure thereof. In accordance with the present invention, an elongated means or insert is arranged away from the inner wall of and preferably coaxially in the elongated hollow member and may extend the length thereof, being internally connected to an openable end and supported in a closed end of the hollow member. Flow lines connect to the hollow member and discharge fluid containing sand against the elongated means, the outer surface of which is imperforate and which is provided with an abrasion resistant surface which may be hardened steel, tungsten carbide, a hardened ceramic surface, or a deformable surface comprised of a plastic or rubbery material which will absorb shock of the abrasive material, such as sand particles.

BRIEF DESCRIPTION OF THE DRAWING

The present invention will be further described and illustrated by reference to the drawing in which:

FIG. 1 is an elevational view of the present invention;

FIG. 2 is an enlarged sectional view of the removable closure means for one end of the device; and

FIG. 3 is a view taken along the lines 3—3 of FIG. 1.

DESCRIPTION OF THE PREFERRED EMBODIMENT WITH REFERENCE TO THE DRAWING

Referring now to the drawing and particularly to the several figures, numeral 10 designates a hydrocarbon production header located on an off-shore platform (not shown) comprised of an elongated tubular member 12 having a closed end 13 and closed openable end 14 closed by a header cap 15 which is secured by closure means 16 which may be any suitable quick opening closure means.

Arranged in the closed end 13 is a supporting means 17 which may be in the form of a funnel shaped receptacle for receiving and supporting the free end 18 of the tubular insert means 19 which is threadably connected co-axially to the inner surface 20 of the removable header cap 15.

Connected to the elongated tubular member 12 is at least one and preferably a plurality of flow lines 21 which extend from the offshore wells (not shown) to the platform (also not shown) and describe an angle of approximately 90° relative to the member 19 but which may be an angle greater than 90°.

A line 22 leads to a separator (not shown) where separation may be made between oil and gas where liquid hydrocarbons are being produced. Each of the flow lines 21 and line 22 are controlled by valves 23 and 24, respectively. Each of the lines 21 and 22 may be arranged 90° relative to each other. However, the angle of line 22 may be greater than 90° but may be arranged at any point on the member 12 and at any angle.

The tubular member 12 is suitably provided with a line 25 controlled by valve 26 for bleeding gas or liquid from the member 12 as may be desired. Line 25a

controlled by valve 26a is also provided for bleeding or draining of liquids and release of pressure before cap 15 is removed.

The tubular insert means 19 is provided with a coating or surface 27 against which the abrasive particles 28 impinge as shown in FIG. 3. The coating or surface 27 may be hardened steel, tungsten carbide, or a deformable coating or surface such as plastic or rubber, either natural or synthetic, such as but not limited to neoprene, natural rubber, ethylene-propylene rubber, ABS (acrylonitrile-butadiene-styrene) rubber, butadiene-styrene rubber, or any other material which resists abrasion and/or shock and, therefore, does not readily erode. While the tubular insert means 19 may extend the length of the tubular member 12, it may only be sufficiently long to absorb the shock of any abrasive particles and may be supported in member 12 by means extending from the inner wall thereof.

Basically, the present invention provides a concentric header insert for the sand particles to impinge against which absorbs the shock thereof and thus reduces the abrasive effect of sand particles on the inside of the header body. The concentric insert may have a shock absorbing surface. The insert may be easily removed for periodic inspection and replacement as required.

The present invention (1) reduces the expense of radioactive, acoustic, or electromagnetic header surveys which are currently being made on a periodic basis and (2) reduces exposure to catastrophic loss of a production platform in offshore waters, to say nothing of avoiding pollution of waters and the environment adjacent liquid hydrocarbon producing wells.

The nature and objects of the present invention having been completely described and illustrated and the best mode and embodiment contemplated set forth, what I wish to claim as new and useful and secure by Letters Patent is:

1. An apparatus for reducing erosion of an elongated tubular header caused by fluids flowing into said header transverse to the axis thereof through an inlet opening comprising:

elongated tubular means extending lengthwise through said header and arranged within said header in the path of fluids entering said header through said inlet opening;

means formed in one closed end of said header for positioning said elongated tubular means in said header and for supporting one end of said elongated tubular means in said header;

a removable member for closing the other end of said header, the other end of said elongated tubular means being attached to said removable member; and

an outlet opening in said header spaced angularly from said inlet opening.

2. Apparatus in accordance with claim 1 in which said elongated tubular means has a deformable outer surface.

3. Apparatus in accordance with claim 1 in which said elongated tubular means has a hardened outer surface.

4. Apparatus as recited in claim 1 in which said elongated tubular means has a hardened ceramic surface.

5. Apparatus in accordance with claim 1 in which said elongated tubular means has a rubbery outer surface.

6. Apparatus in accordance with claim 1 in which said elongated tubular means is removably attached to said closure member.

7. Apparatus in accordance with claim 1 in which said elongated tubular member comprises a hydrocarbon production header; said positioning and supporting means comprises a funnel-shaped receptacle; and said elongated tubular means includes an abrasion resistant outer surface in an imperforate tubular member.

8. Apparatus in accordance with claim 7 in which said elongated tubular means includes a deformable outer surface.

9. Apparatus in accordance with claim 7 in which said elongated tubular means includes a hardened outer surface.

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