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J. F. FLOYD

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WELLHEAD EQUIPMENT

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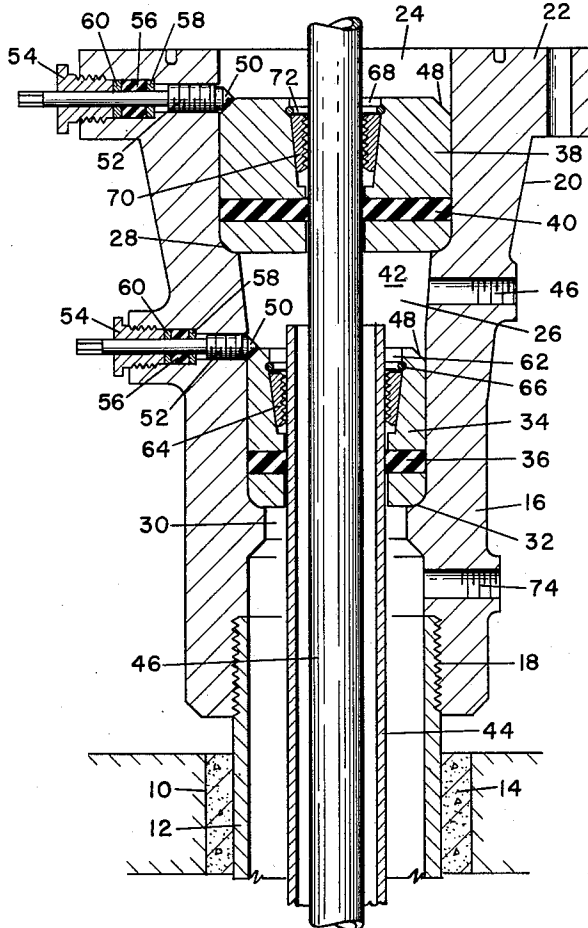


FIG. 1.

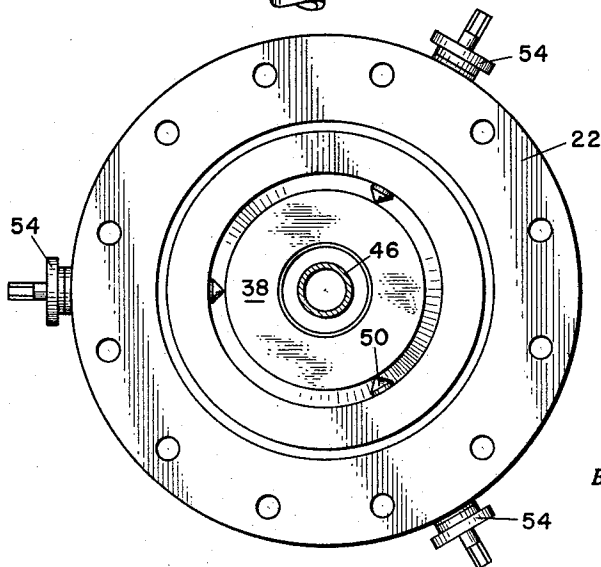


FIG. 2.

INVENTOR.
JAMES F. FLOYD,

BY *Frank S. Troidl*

ATTORNEY

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WELLHEAD EQUIPMENT

James F. Floyd, 1518 Lehman, Houston 18, Tex.

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1 Claim. (Cl. 166—89)

This invention relates to wellhead equipment. More particularly, this invention relates to a compact wellhead assembly using only one housing structure for supporting a plurality of tubing or casing hangers.

In certain operations for producing oil and gases from wells, it is highly desirable that the wellhead be as small as possible so as not to extend too far above the surface of the earth. For example, wellheads used on underwater wells should be compact. The invention to be described herein includes only a single unitary housing structure in combination with the tubing or casing hangers. This structure provides the art with a small and compact wellhead.

Since this invention consists of a small number of parts, secondary pack-offs, studs, nuts, ring gaskets, casing head spools, casing head bodies, and tubing heads formerly needed are made unnecessary.

Briefly described, this wellhead includes a housing provided with a plurality of vertically spaced-apart annular shoulders. A casing or tubing hanger is supported by each shoulder. Each hanger, with the exception of the top hanger, extends upwardly to a point spaced below the next upper shoulder. Radial outlets are provided in the housing and extend through the housing from the spaces provided between the hangers.

A better understanding of this invention as well as its many advantages may be further understood by reference to the following detailed description and drawings in which:

FIG. 1 is an elevational view partly in section showing the new wellhead; and

FIG. 2 is a top view of FIG. 1.

Referring to the drawings, a well 10 is shown having the conventional surface casing 12 cemented to the well by means of conventional cement 14. The surface casing 12 is connected to the lower portion of the housing 16. Surface casing 12 may be screw threaded to the housing 16 by means of threads 18 as shown in FIG. 1. If desired, various other means may be used for connecting housing 16 to surface casing 12 such as welding.

The external surface of the housing 16 tapers downwardly and inwardly. By providing the taper, the thickness of the housing 16 is greater at the top as at 20 than at the bottom portion of the housing. This greater thickness provides for high pressures in the top area.

Extending from the top flanged portion 22 of the housing 16 is a counterbore 24. A second counterbore 26 of smaller diameter than counterbore 24 is provided below counterbore 24. Thus, an annular shoulder 28 is provided internally of the housing 16. A third bore 30 of still smaller diameter is formed below counterbore 26, thus providing an annular shoulder 32 below annular shoulder 28. Thus, the internal surface of the housing structure 16 is provided with a plurality of vertically spaced-apart annular shoulders. Although only two such shoulders are shown, it is to be understood that more shoulders can be provided in the unitary housing structure if desired.

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A casing hanger 34 including a packing ring 36 is supported by the annular shoulder 32. A tubing hanger 38 including packing ring 40 is supported by annular shoulder 28. The casing hanger 34 extends upwardly within counterbore 26 to a point spaced below the annular shoulder 28. Thus, an unobstructed space 42 is provided between the casing hanger 34 and the tubing hanger 38. Therefore, an unobstructed flow path is provided for fluids flowing from a subsurface formation up the casing 44 and through the radial outlet 46 extending from space 42.

The packing ring 36 isolates the pressure within the casing 44-surface casing 12 annulus. Packing ring 40 isolates the pressure within the tubing 46-casing 44 annulus from the pressure within the tubing 46.

Each of the hanger assemblies is provided with a beveled surface 48. The surface 48 is shaped to receive the tapered end 50 of a hold-down screw lock 52. Each screw lock is provided with a gland 54 which can be screwed into the structure 16 to hold packing 56, located between disks 58 and 60, firmly in place.

The casing hanger 34 is provided with a counterbore 62 in which is seated a conventional slip arrangement 64. The slip 64 is held in place by snap ring 66. The slip 64 serves to support the casing 44 within the well 10.

Tubing hanger 38 is likewise provided with a counterbore 68 in which is located the conventional slips 70 held in place by snap ring 72. Slip 70 supports the tubing 46 within the well 10.

Fluids flowing upwardly in the casing 44-surface casing 12 annulus are conducted from the well through radial outlet 74.

The above described structure has several advantages over conventional wellhead assemblies. For example, the structure 16 is a single unitary structure. It is made of a single casting or forging. This, of course, makes the wellhead lighter and stronger while decreasing the height of the assembly which is very important in certain operations such as underwater well operations.

Another important feature of this invention is that individual seating shoulders are provided for each casing or tubing hanger. Thus, each shoulder supports the weight of a separate string of casing or tubing or multiple strings. There is absolutely no interrelationship between the hangers. Thus, none of the weight of a string of casing or tubing supported by one hanger is supported by another hanger.

A further important feature is that the radial outlets such as outlets 46 are located between the hangers 34 and 38. An unobstructed fluid flow path exists from the tubing-casing annulus to the outlet 46.

Notice also that each higher shoulder is larger in diameter. Thus, the tubing hanger can easily support multiple strings of tubing. The greater thickness at 20 of structure 16 also allows for increasing pressures.

A further feature of this invention is that it is only necessary to place a blowout preventer on the housing 16 once during the completion of a well. Also, if, for example, it is desired to drill slim holes, the casing hanger assembly 34 can be removed and only the tubing hanger 38 used to support the tubing.

I claim:

A wellhead comprising: a singular unitary housing structure having a plurality of counterbores formed there-

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in from the top thereof, with each successive lower counterbore having a smaller diameter, thereby providing the internal surface of said housing structure with a plurality of vertically spaced-apart annular shoulders; a removable hanger supported by each shoulder and having a lower surface adapted to rest upon the shoulder so as to be supported by the shoulder, each removable hanger extending upwardly to a point spaced below the next upper shoulder; and at least one radial outlet extending through said housing structure from each space thus provided between said hangers.

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