Abstract



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Large Bore Subsea Christmas Tree and Tubing Hanger System

A concentric tubing hanger 12 includes a radially offset tubing annulus passage 22 closeable by a remotely operable valve, preferably a pressure balanced, hydraulically operated shuttle valve 32 at the upper end of the passage 22. The hanger 12 is of relatively compact design, accommodating a large diameter production bore and a large number of downhole service lines 46. Service line couplers 35 and outlet ports 30 of the valve 32 are housed in a void 34 defined between the tubing hanger and a seal stab assembly 36 of a subsea Christmas tree 10. The couplers 35 are bathed in annulus fluid. A tubing hanger running tool (76, fig. 4) includes a slot (80, fig. 4) and orientation helix (86, fig. 4) which co-operate with a key 82 projecting into the production bore 20 to provide passive orientation between the tool (76) and hanger 12. A subsea Christmas tree (100, fig.5) has an annulus conduit including a deviated portion (112, fig. 5) allowing room in the tree block for a bypass conduit and valve (118, 116 fig. 5). Two or more valves in the production flow path may be substituted by crown plugs to save tree bulk and weight.



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Figure 1