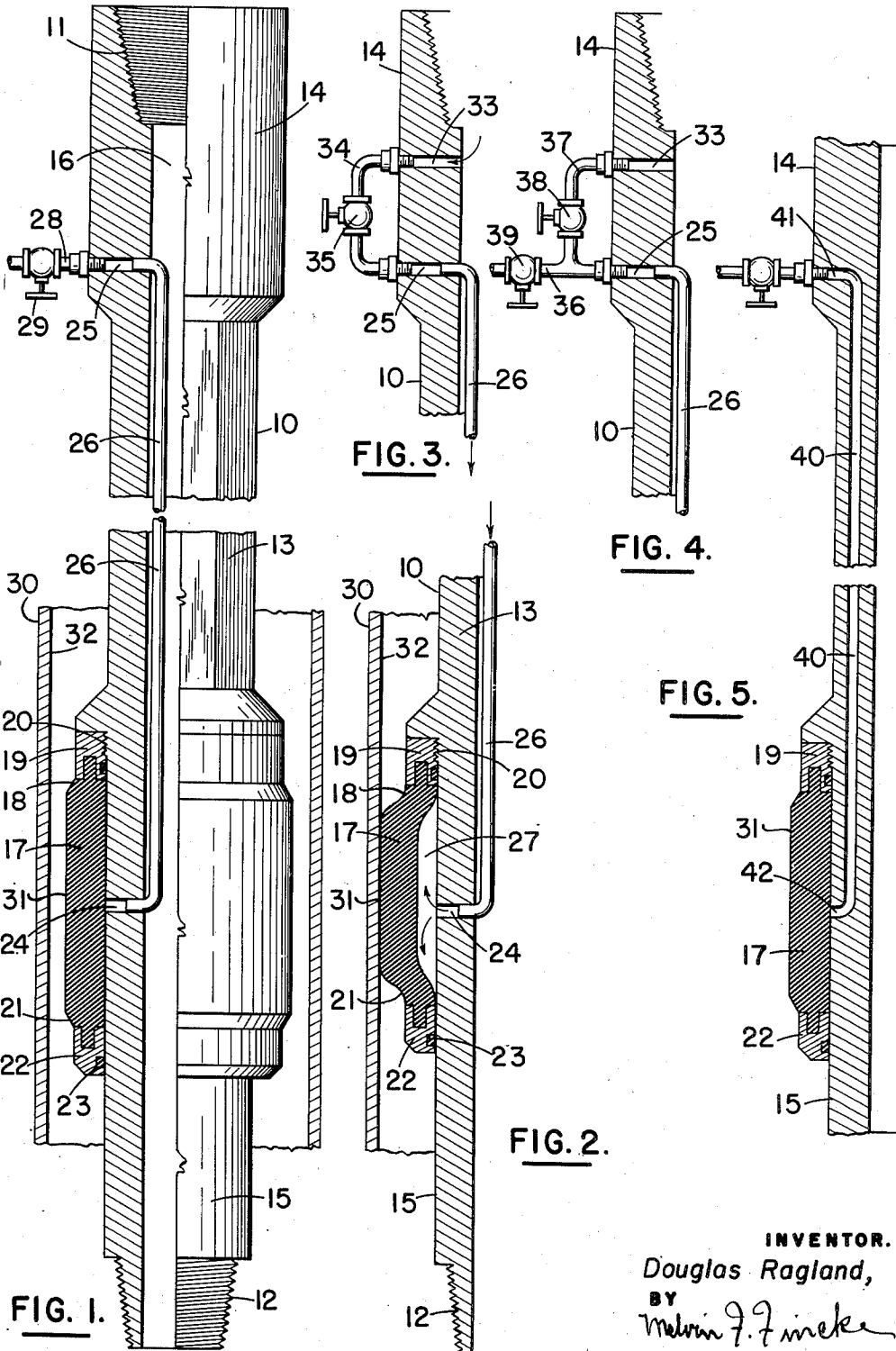


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COMBINATION STABILIZER AND HYDRAULIC
PACK-OFF KELLY JOINT
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COMBINATION STABILIZER AND HYDRAULIC PACK-OFF KELLY JOINT

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1 Claim. (Cl. 255—28)

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The present invention relates to that type of oil well tool used in the drilling of koreholes into subsurface formations, particularly in the drilling of boreholes for the production of oil and gas, commonly known as a Kelly bar or Kelly joint. More particularly, this invention relates to a combination stabilizer and hydraulic pack-off for use on the lower end of such a tool.

In the drilling of boreholes in subsurface formations by the rotary drilling method, a drill stem carrying a bit at its lower end and suspended at least partially at its upper end by means of a drilling line is rotated in the borehole by means of a power driven rotary table. In use the Kelly joint is really the uppermost section of the drill stem and passes through the center of the rotary table. The rotary table carries a Kelly drive bushing for engaging the polygonal stem, usually square or hexagonal, of the Kelly bar so that the Kelly bar may be rotated thereby and moved vertically therethrough. While the Kelly bar is polygonal for a major portion of its midsection, it is normally cylindrical at or near its top and bottom ends, the said ends carrying either pin or box connections. The upper and lower cylindrical portions are normally greater in diameter than the remaining portion of the bar. Commonly the lower cylindrical section of the conventional Kelly joint is equipped with a circumscribing rubber sleeve to stabilize the Kelly joint and to prevent excess wear of the lower end of the Kelly joint and the surface casing. Thus, the only functions of the rubber sleeve on the conventional Kelly joint are to absorb shock and to reduce wear.

In the drilling of borehole into subsurface formations for the production of oil and gas, conventional rotary drilling rigs usually employ at least one high-pressure blowout preventer, two or more such preventers being used in many situations. These blowout preventers include rubber-faced hydraulic rams capable of being closed around the Kelly joint or around drill pipe in case of a threatened blowout. With the rubber-faced hydraulic rams closed around either the Kelly joint or the drill pipe, escape of the fluid from the well is prevented. If it is desired to secure protection against blowout at all times, at least two blowout preventers must be provided, one of which is adapted to close around the Kelly joint, the other being adapted to close around the drill pipe.

The object of my invention is to provide a device for shutting in a well which is blowing out or threatening to blow out. A further ob-

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ject is to provide a Kelly joint having a rubber sleeve which will normally serve as a stabilizer and which can be used as a pack-off between the Kelly joint and the surface casing when a blowout is threatened. A further object is to provide a rubber sleeve on the lower end of a Kelly joint which can be inflated by the application of fluid under pressure, the rubber sleeve acting as a stabilizer when not inflated and acting as a blowout preventer when inflated.

My invention may be briefly described as a Kelly joint having at its lower end a combination stabilizer and pack-off unit consisting of an inflatable sleeve mounted on an outer surface of the lower end of the joint, and a conduit carried by the Kelly joint fluidly connecting the inside diameter of the rubber sleeve with the upper end of the Kelly joint and with a source of fluid under pressure, the sleeve being inflatable by means of fluid supplied through the conduit. During normal operations, the sleeve will serve in its uninflated state as a stabilizer; when needed as a pack-off, the sleeve is inflated.

The device of my invention is illustrated in the accompanying drawings in which:

Fig. 1 is an elevational view, partly in cross-section, of one embodiment of my invention, the rubber sleeve being in its normal deflated position;

Fig. 2 is a cross-sectional view of the embodiment shown in Fig. 1, the rubber sleeve being shown in its inflated position;

Fig. 3 is a view, partly in cross-section, of a modification of the embodiment shown in Figs. 1 and 2;

Fig. 4 is another modification of the embodiment shown in Figs. 1 and 2; and

Fig. 5 is a cross-sectional view of another embodiment of my invention.

In the drawing, like numerals refer to like parts throughout. Turning now to Figs. 1 and 2, numeral 10 designates a Kelly bar or grief stem having an upper threaded end 11 adapted to be threadedly engaged with a fluid conduit, such as a swivel, and a lower threaded end 12 adapted to be threadedly engaged with a threaded tubular member, such as a section of drill pipe. Numeral 13 designates an intermediate polygonal portion of the kelly while 14 designates an upper cylindrical portion and 15 designates a lower cylindrical portion. A longitudinal extending central passage 16 traverses kelly 10.

Mounted on lower cylindrical portion 15 is radially distensible, resilient sleeve 17. The upper

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edge 18 of sleeve 17 is secured in fluid tight relation to cylindrical portion 15 by means of retaining ring 19, retaining ring 19 being secured to cylindrical portion 15 by suitable means, as by means of threads 20. The lower edge 21 of sleeve 17 is maintained in sliding sealed contact with cylindrical portion 15 by means of guide ring 22 which may carry recessed in its inner surface a packing ring 23. Packing ring 23 may be of any material which will provide a fluid-tight seal between retaining ring 22 and cylindrical portion 15 when the retaining ring moves longitudinally along said portion.

A port 24 traverses the wall of portion 15 while port 25 traverses the wall of portion 14. A conduit 26 fluidly connects port 24 with port 25, extending longitudinally within central passage 16 of the kelly. Port 24 is located in portion 15 at such a point that it communicates with the space 27 between sleeve 17 and the outer surface of cylindrical portion 15 when sleeve 17 is in its inflated state, as shown in Fig. 2. That portion of port 25 adjacent the outer cylindrical surface of portion 14 is threaded as shown for screw threadedly receiving a suitable threaded conduit or hose 28 connected to a source of fluid under pressure, not shown. The flow of fluid through conduit 28 may be controlled by valve 29.

During normal drilling operations when no blowout is anticipated or expected, radially distensible resilient sleeve 17 will be in its uninflated state, as shown in Fig. 1. When so used, hose 28 and valve 29 may of course be disassociated from the kelly. When used in this manner, radially distensible sleeve 17 merely acts as a Kelly stabilizer or bumper so as to protect the kelly from undue wear by preventing contact with surface casing 30 in which it is being moved longitudinally and rotatably. When it is desired to prevent a blowout, radially distensible sleeve 17 is inflated, as shown in Fig. 2, by means of connecting hose 28 with the threaded portion of port 25, if it is not already so connected, and then opening valve 29 so as to permit fluid under pressure to flow through port 25, conduit 26, and port 24 into the space 27 between the outer surface of portion 15 and sleeve 17. Inflation of sleeve 17 forces the outer surface 31 thereof into sealing contact with the inner surface 32 of casing 30, thereby preventing fluids from flowing in casing 30 past kelly 13. Of course, when sleeve 17 is inflated guide ring 22 slides upwardly along the outer surface of portion 15 in sealing contact therewith. When the pressure in space 27 is relieved, as by means of disconnecting hose 28 from threaded port 25, radially distensible sleeve 17 resumes its normal position, as shown in Fig. 1.

Radially distensible resilient sleeve 17 may be made of any suitable material which is capable of normally assuming the hollow cylindrical shape shown in Fig. 1 and which is capable of being inflated as shown in Fig. 2. A good grade of rubber satisfies these requirements, although other materials such as synthetic rubber or natural rubber reinforced with steel ribs or wires may be employed.

Fig. 3 illustrates a variation of the device shown in Figs. 1 and 2. In that figure, upper portion 14 of kelly 10 is shown as having a port 25 and an additional port 33 traversing the walls of portion 14. Ports 25 and 33 are fluidly connected by means of conduit 34 controlled by valve 35, conduit 34 and valve 35 being positioned exteriorly

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of portion 14. Port 25 is fluidly connected with conduit 26. In this modification the drilling fluid itself is employed in providing a fluid under pressure in the space 27 between sleeve 17 and the outer surface of portion 15, as shown in Fig. 2. Thus, drilling fluid is admitted to the aforesaid space by merely opening valve 35 and increasing mud pressure in central passage 16. Similarly, after sleeve 17 is once inflated, it may be deflated by reducing the pressure in central passage 16. After sleeve 17 has returned to its normal position, as shown in Fig. 1, valve 35 is closed to prevent inflation of the sleeve until it is again needed as a pack-off.

Fig. 4 shows a manifolding arrangement which permits of the employment of either the drilling mud itself or an outside source of fluid under pressure. In that figure the upper cylindrical portion 14 of kelly 10 is shown as having ports 25 and 33 with conduit 26 fluidly connecting with port 25. A conduit 36 fluidly connects with the outer terminus of port 25 and conduit 37 fluidly connects the outer terminus of port 33 with conduit 36. Valve 38 is positioned in conduit 37 and controls the flow of fluid therethrough while valve 39 is positioned in conduit 36 and controls the flow of fluid from the outside source of fluid under pressure to port 25 and conduit 26. By employing the manifold arrangement shown in Fig. 4, radially distensible sleeve 17 may be inflated either with drilling fluid from central passage 16 or with fluid under pressure from an outside source. If it is desired to employ a fluid under pressure from an outside source, valve 38 is closed and valve 39 is opened, thus permitting fluid to flow through conduit 36, port 25, and conduit 26 to the space 27. Sleeve 17 may be deflated when desired by disconnecting conduit 36 from the outside source of fluid under pressure and permitting the fluid to bleed from conduit 26, port 25, and conduit 36. If it is desired to inflate sleeve 17 with drilling fluid, valve 39 is closed and valve 38 is opened. With this setting of the valves, drilling fluid flows through port 33, conduit 37, conduit 36, port 25, and conduit 26 into space 27. As mentioned before, such a flow of drilling fluid may be produced by increasing the pressure on the drilling fluid in central passage 16. After sleeve 17 is once inflated with drilling fluid, it may be deflated when desired by decreasing the pressure on the drilling fluid in central passage 16, thus permitting fluid to escape from space 27. When sleeve 17 has returned to its normal uninflated state, as shown in Fig. 1, valve 38 is closed.

Instead of employing a conduit and positioning this conduit in central passage 16, as shown in Figs. 1 to 4, inclusive, a conduit may be formed within the walls of the Kelly bar itself. Thus, in Fig. 5 another embodiment is shown wherein a longitudinally extending passage 40 is formed in the wall of Kelly bar 10. Longitudinally extending passage 40 terminates in passage 41 which connects with the outer surface of section 14 of the Kelly bar and terminates at the other end in transversely extending passage 42 located in cylindrical portion 15 of the kelly. Passage 42 opens into the space between the inner surface of radially distensible resilient sleeve 17 and the outer surface of portion 15. In all other respects, the embodiment shown in Fig. 5 is identical with the embodiment shown in Figs. 1 and 2, and will not be further described.

Having fully illustrated and described the de-

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vice of my invention, what I wish to claim as new and novel and to secure by Letters Patent is:

A girth stem comprising a tubular member defining a central longitudinal passage there-through and defining a portion having a cylindrical outer surface adjacent each end thereof and an intermediate portion the outer surface of which is polygonal in cross section, a radially distensible resilient sleeve mounted on one of said portions having a cylindrical outer surface, one edge of said sleeve being affixed to said portion and the other edge being arranged to move slidably on said portion in fluid-tight relation with the cylindrical surface thereof, a conduit extending longitudinally along said tubular member and fluidly connecting the space between said sleeve

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and said cylindrical surface with the outer surface of said tubular member adjacent the other end thereof.

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