

Dec. 2, 1958

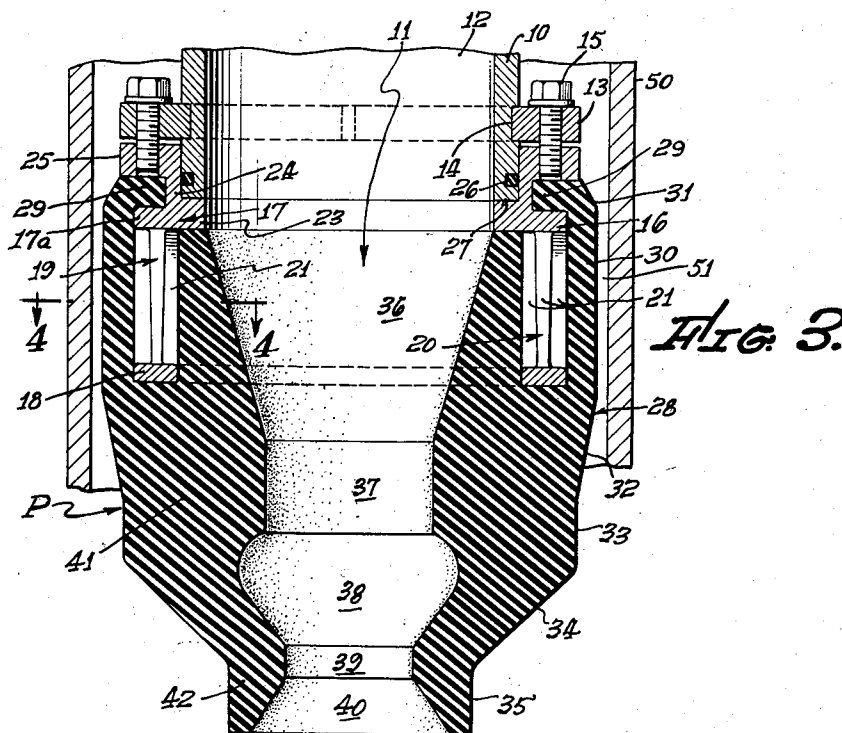
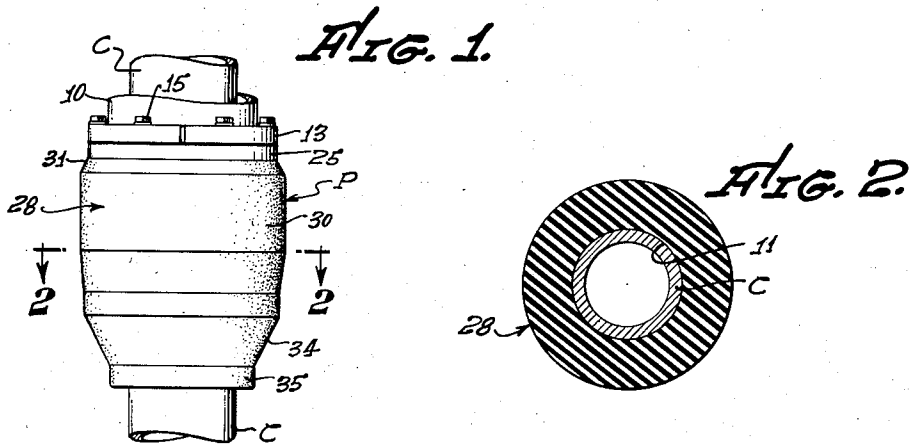
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2,862,735

KELLY PACKER AND BLOWOUT PREVENTER

Filed May 23, 1955

2 Sheets-Sheet 1



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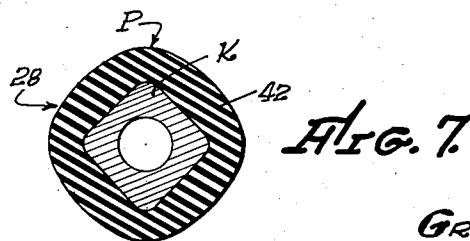
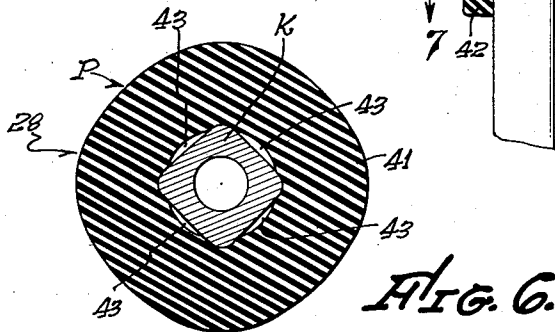
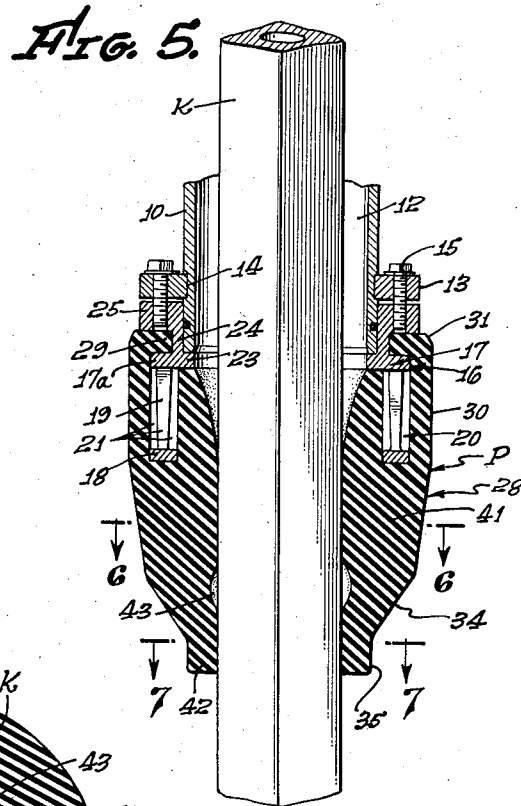
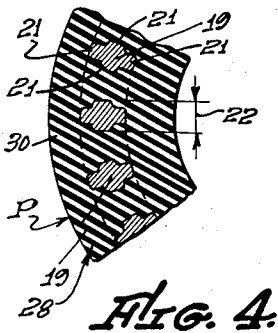
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KELLY PACKER AND BLOWOUT PREVENTER

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2 Sheets-Sheet 2



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1

2,862,735

KELLY PACKER AND BLOWOUT PREVENTER

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Original application August 19, 1950, Serial No. 180,480, now Patent No. 2,731,281, dated January 17, 1956. Divided and this application May 23, 1955, Serial No. 510,456

7 Claims. (Cl. 286—16.2)

This invention has to do generally with packers for use in connection with well drilling equipment and is more particularly concerned with packers adapted especially well to be used in connection with strippers, kelly packers and blowout preventers, and the like, though not limited to such specialized use.

This application is a division of my copending application Serial No. 180,480, Kelly Packer and Blowout Preventer, filed August 19, 1950, issued January 17, 1956 as U. S. Patent 2,731,281.

For purposes of discussion, I will describe my improved packer in the environment of the parent application, identified above, but this is not to be construed as in any way limiting the invention, nor as inferring that its features of advantage are restricted to this particular environment.

It is the major object of the invention to provide a packer which is adapted to pack off effectively around work such as drill collars, pipes, or kellys, regardless of the transverse cross sectional characteristics of the work. For instance, kellys are of non-circular transverse cross section, usually being square or, at least, polygonal; though some of them are elliptical. As is well understood, it has always been difficult effectively to pack off such members, particularly if they are square, and my improved packer solves this difficulty completely. By the same token, it is adapted to function with great efficiency where the work is circular. Thus, the packer is especially well adapted to stripping operations carried on in connection with a drill string where the transverse cross section of the work to be packed off varies from the circularity of a drill collar to the squareness of a kelly.

Generally, the packer is in the nature of a sleeve of rubber or the like, having a rigid armature which is adapted to be connected at one end to and depend from a tubular supporting member. The rubber sleeve is preferably continued axially beyond the free end of the armature, the extended portion preferably having a bore of relatively diminished diameter. The armature is preferably of cage-like nature, permitting limited radial "breathing" of the packer rubber in the armatured zone as drill string enlargements pass through the packer bore. This point, as well as other features and objects of the invention will be made clear in connection with the following detailed description, reference being made to the accompanying drawings, in which:

Fig. 1 is an elevation of the improved packer, showing it applied to work in the nature of a drill collar;

Fig. 2 is a section on line 2—2 of Fig. 1;

Fig. 3 is an enlarged longitudinal, axial section through the packer, showing the latter in its relaxed condition, the packer being connected to a supporting sleeve;

Fig. 4 is a fragmentary section on line 4—4 of Fig. 3;

Fig. 5 is a longitudinal section similar to Fig. 3, but of reduced scale, and showing the packer constricted about a square kelly;

Fig. 6 is a section on line 6—6 of Fig. 5; and

Fig. 7 is a section on line 7—7 of Fig. 5.

2

In Figs. 2, 3 and 5, I have illustrated fragmentarily a sleeve 10 which may be considered as a tubular supporting member for the packer, generally indicated at P. In the environment of the parent application, identified above, this sleeve represents a member of a rotatable, tubular head (not here shown) which is, in turn, supported from beneath by other packing head equipment (not here shown). Broadly, however, sleeve 10 may be considered as a tubular supporting member to which the packer is connected and from which it depends, the packer bore, generally indicated at 11, being concentric with the bore 12 of the supporting member.

The particular nature of the means whereby packer P is dismountably connected to member 10, is not of significance to the present invention, but the illustrated means will be described briefly. Thus, I have shown a two-part or diametrically split mounting ring 13, whose halves are entered in the groove 14, provided near the end of sleeve 10, after the packer P is slipped onto the sleeve, as in Fig. 3. The ring halves are then bolted at 15 to the packer, said assembly thereafter holding the ring halves against separation, and the ring, in turn, suspending the packer from sleeve 10.

Packer P includes a rigid metal armature generally indicated at 16 which is made up of rings 17 and 18 held in vertically spaced relation by integral bars 19. These bars are circumferentially spaced apart (Fig. 4) and may be considered, together, as making up an open-work cage 20. Each bar 19 preferably has four vertically extending and equi-angularly spaced ribs 21. The angular spacing between the bars is preferably, though not necessarily approximately equal to the lengths of their minor axes 22. Preferably, also, the bars have slight inward and downward taper.

Upper ring 17 has an external flange portion 17a, internal horizontal flange-portion 23, a vertical flange portion 24, and, at the top of vertical flange 24, an external horizontal flange 25. Flange 24 fits nicely around sleeve 10 and, preferably, there is an O ring seal 26 between the opposed peripheral faces of the flange and sleeve.

Flange 25 takes bolts 15 and, when these bolts are tightened up, flange 23 is brought into tight contact with the lower end face 27 of sleeve 10.

Armature 16 is preferably molded into the packer-proper 28, this packer being in the form of a sleeve of resilient plastic material such as natural or synthetic rubber and preferably has a durometer hardness of from 65 to 70. The upper end 29 of sleeve 28 is molded over the top of armature flange 17a. Externally, the sleeve 28 has a cylindrical portion 30, a short, upwardly and inwardly tapered portion 31 above the cylindrical portion, a downwardly and inwardly tapering portion 32 just below the cylindrical portion, a cylindrical portion 33, a more sharply tapered portion 34, and a terminal cylindrical portion 35.

Internally, sleeve 28, when relaxed as in Fig. 3, has a downwardly converging, tapered bore 36 leading to a cylindric bore 37 which is vertically spaced by the concavity 38 from the smaller-diameter and shorter cylindrical bore 39. An outwardly flaring bore 40 opens to the lower, free end of the packer sleeve.

The sleeve 28 thus has relatively thick walls 41 at its central portion, and a tapered lip formation 42 near its lower end which has a tendency to flex bodily outwardly about concavity 38 when a kelly, such as K (Fig. 5) is inserted therethrough.

The described formation of the armature 16 serves to anchor the material of the upper end of packer 28 so external well pressure will not objectionably radially collapse the upper end of the packer nor cause objectionable axial flow of the packer material. However, the circumferential spacing of bars 19 permits the limited radial

"breathing" of the packer necessary to the passage of drill string enlargements through its bore.

As an example of relative sizes, I have found the following to give very satisfactory results. With a square kelly which is $3\frac{1}{2}$ " across the flats, the diameter of bore 37 may be $3\frac{1}{4}$ ", the major diameter of cavity 38 may be 4" and the diameter of bore 39 may be $2\frac{1}{4}$ ". When a kelly of such dimension is thrust through a packer having the given dimensions, the packer is deformed to take, approximately, the shape shown in Figs. 5, 6 and 7. The thick-walled central portion 41 of the packer effectively grips the kelly but will not ordinarily engage the full faces thereof, and thus small voids, such as at 43, will be left (Fig. 6). The sealing lip 42, will, however, tightly engage the kelly throughout its perimeter. Then, when the well pressure is applied to the outer face of the packer, the voids 43 disappear, and the central portion 41 of the packer, as well as lip portion 42, sealingly engages the kelly and resists the efforts of even extremely high well pressure to cause leakage between the kelly and the packer.

A packer having approximately the above dimensions, will also accommodate and seal inwardly against pipe, drill collars or pipe joints from about $2\frac{3}{8}$ " diameter up to about $4\frac{3}{4}$ " diameter. It will thus continuously sealingly engage the various elements on a drill stem as the latter is stripped through it, the packer radially yielding sufficiently to allow tool joints (not shown) and other enlargements on the drill stem to strip therethrough, and resiliently returning to sealingly engage the smaller diameter portions of the stem, as they are subsequently reached. Figure 3 shows a protective tubular metallic housing 50 extending about the cage structure and everywhere spaced at 51 from the packer 28 so that well pressure may enter space 51 to collapse the packer thickened material toward the string.

While I have shown and described a particular embodiment of my invention, various changes may be made in detail without departing from the spirit and scope of the appended claims.

I claim:

1. An oil well stripper packer assembly for packing off about a string of equipment in the well while the equipment is being moved therethrough, said assembly comprising a rigid cage structure including upper and lower rings extending about an upright axis and circularly spaced elongated bars interconnecting said rings, and an annulus of resilient plastic material embedding said cage structure and extending therebelow, said annulus being progressively radially thickened inwardly opposite the cage bars in a downward direction and forming a bore tapering downwardly for engagement with portions of said string being moved therethrough, said annulus having a free outer surface and having continuous body extent from between said bars radially inwardly to said tapered bore and outwardly to the free outer surface of the annulus whereby well pressure exertion against said free outer surface is adapted to displace bodily some of

said material radially inwardly between said bars thereby radially inwardly collapsing said bore about the string which on being moved axially through said bore is at times adapted to expand radially said bore thereby bodily displacing some of said material radially outwardly between said bars, while said thickened material remains anchored at all times to the cage resiliently blocking upward pressural extrusion of the material therebelow.

2. The invention as defined in claim 1 in which said bore below cage level has a reduced diameter less than the minimum internal diameter of the cage.

3. The invention as defined in claim 2 in which said bore is locally enlarged below said reduced diameter and above the lower end of the annulus.

4. The invention as defined in claim 3 in which the lowermost portion of said annulus forms a downwardly flaring bore mouth.

5. The invention as defined in claim 1 including a tubular metallic housing extending about said cage bars and everywhere spaced from the free outer surface of said annulus for admitting well pressure into said space to collapse said thickened material radially toward said string.

6. The invention as defined in claim 1 in which said material radially outwardly of said bars extends vertically and continuously from below the level of said lower ring to above the level of said upper ring, an annular portion of said material inwardly overlapping said upper ring.

7. The invention as defined in claim 4 in which said annulus has a radially relatively thin annular lip projecting toward said axis vertically between said local enlargement of the bore and said downwardly flaring bore mouth, the entire outer surface of the annulus radially outwardly of said lip extending within a cylindrical axial projection of the cage lower ring, said lip being radially outwardly expandable by the peripheral corners of a polygonal kelly in the string being moved through said annulus and being radially inwardly collapsible against the peripheral faces of said kelly to seal off about the entire kelly periphery in response to well pressure application to the free outer surface of said annulus.

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