Nov. 24, 1953 C. H. SWEET 2,660,247

RETRIEVABLE WELL PACKER

Filed Sept. 13, 1949 2 Sheets-Sheet 1

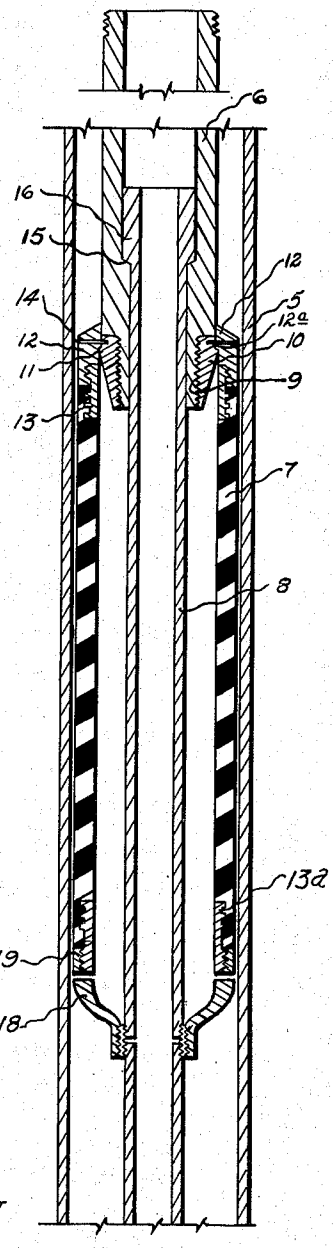


FIG. I

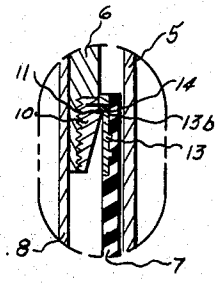


FIG. IV

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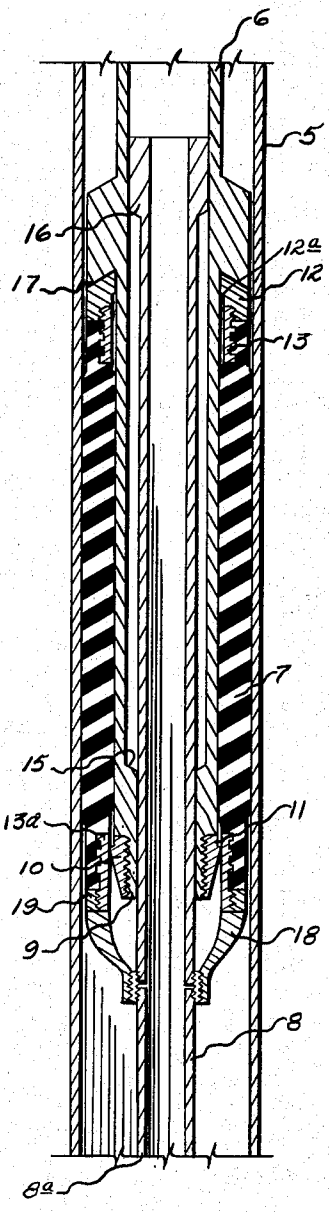


FIG. II

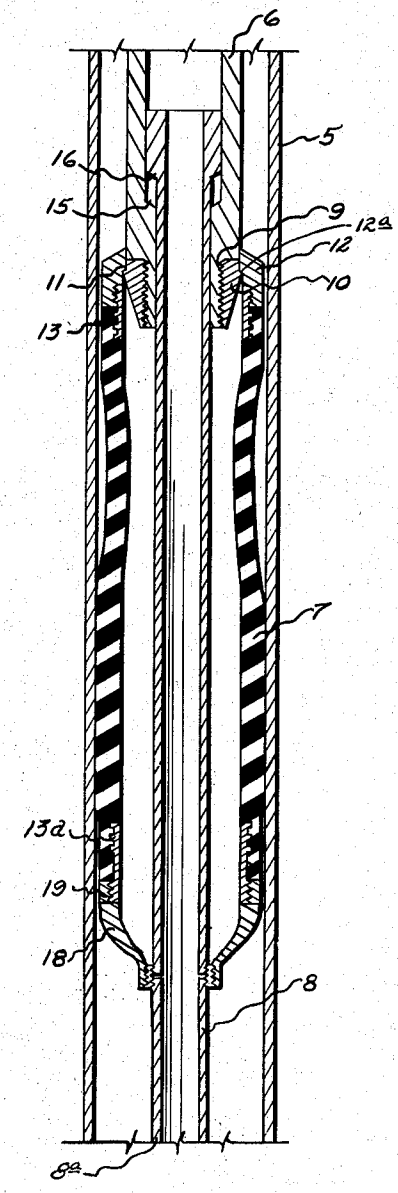


FIG. III

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UNITED STATES PATENT OFFICE

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RETRIEVABLE WELL PACKER

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2 Claims. (Cl. 166—10)

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This invention relates to oil well packers having cylindrical packing elements composed of rubber or other deformable material and more particularly to the type in which the pack is accomplished by compression applied to the ends of the deformable element to distort it into sealing contact with an inner mandrel and a well bore or casing.

It is not pertinent to the invention whether or not the well is cased, however for convenience the description will indicate procedure within a cased well.

As is well known in the art the packing element frequently adheres to the well bore after the setting or packing operation has been accomplished and its removal from the well under such circumstances frequently entails quite extended and expensive operations. My invention provides novel means whereby the packing element is readily retrieved and withdrawn from contact with the well bore and out of the well. These and other novel features will readily occur to those skilled in the art from the following description together with the accompanying drawings in which:

Figure I shows a packer being run or lowered into a well.

Figure II shows the packer in the set position in the well.

Figure III shows the packer being withdrawn from the well.

Figure IV shows a modified form of end section of my packing element.

In the several views like references indicate similar parts wherein 5 is a well casing at normal position in a well. 6 is a mandrel of major size which is connected at its upper end to a string of well tubing by threaded means, which tubing string extends to the surface whereby the packer is manipulated as desired in the well servicing operation. Mandrel 6 is of such outer diameter as to be freely movable within the bore of a packing element 7 when the latter is in a normal or undistorted position. A minor mandrel 8 is telescopically disposed within major mandrel 6 and extends downwardly and operatively is connected to a tail pipe at its lower end 8a which extends to the bottom of the well or to slips which selectively engage with the well casing to limit downward movement of the packer assembly in the well. Since these elements are conventional and fully understood by skilled operators and constitute no part of the present invention detail description of same will not be made herein. As shown in Figs. I, II, and III,

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major mandrel 6 has a reduced end section 9 which is outwardly threaded for engagement with an inwardly threaded collar 10 which latter has a shoulder 11 which is of larger outside diameter than the inside diameter of an abutment 12a on the traveling ring 12 which is threadedly engaged with upper end metal insert 13 of the packing element 7 while shear pins 14 pass through openings in traveling ring 12 and into collar 10 as shown in Figures I and IV. Outer mandrel 6 has an inner annular shoulder 15 of large inner diameter than the outer annular projecting flange 16 on the upper end of minor mandrel 6. These interfering projections act to limit elongating movement between the mandrel parts for purposes to be described later in more detail. As shown in Fig. II, major mandrel 6 is provided with an outwardly projecting packer seat 17 for engaging traveling ring 12 through which the packing element may be pressed downwardly as will later more fully appear. Minor mandrel 8 supports a packer seat 18 for receivably engaging lower packer insert 13a which is reinforced by threaded collar 19.

The operation is as follows:

Mandrels 6 and 8 are telescopically assembled at the surface and collar 10 is threadedly engaged on mandrel 6, and traveling ring 12 is screwed onto the threaded metal insert 13 of the packing element and shear pins driven into place which secures the packing element in position on the assembly. Extension 8a of mandrel 8 is threadedly engaged with a tail pipe assembly which if desired may carry a set of slips or be extended for such length as desired. The purpose of either such facility is to selectively define the limit of downward travel of mandrel 8 in the well. Mandrel 6 extends upwardly and engages with a pipe string by which the packer is lowered into the well into the position shown in Fig. I. At this point the tail pipe extension comes to rest on the bottom of the well or the slips are manipulated through the pipe string to engage with casing 5.

A further lowering of the supporting pipe string will bring the packer to rest on seat 18, as shown in Fig. II, following which pins 14 will have been sheared and upon further lowering of the pipe string upper packer seat 17 engages traveling ring 12 and finally compresses packing element 7 into sealing contact with mandrel 6 and casing 5.

It will be noted that as shown in Figure I, packing element 7 is of sufficiently large inside diameter to freely receive major mandrel element 6 and is small enough outside diameter to

readily be passed through the well bore. The annular space shown in Fig. I between inside packing element 7 about mandrel section 8 allows for relief from binding engagement between element 7 and the well casing. Also the traveling ring 12 and collar 19 and all other parts are small enough to freely pass through the casing. The mandrels provide an opening through which any desired operation may now be performed in the well below the packer such as acidizing or the recovering of the production from the formation.

When the service operation has been completed and it is desired to retrieve the packer and assembled parts from the well, the string is picked up by the mechanism usually provided at the surface about the well for that purpose.

Progressively as upward movement is effected mandrel 6 is withdrawn from inside packing element 7 as shown in Fig. III until the inner projection of traveling ring 12 is engaged by shoulder 11 of mandrel 8. Mandrel 8 has now been withdrawn from inside packing element 7 and the latter is free to distort inwardly away from the well casing. As is now shown in Fig. I, continued upward movement of the string will elongate the packing element 7 and thereby reduce its wall thickness and outside diameter and effect the release of the packer from engagement with the casing. This movement and action continues until interferences 15 and 16 of the mandrel sections are engaged at or before which point the packing element has been entirely freed from the well bore and is fully retrievable to the surface and from the well in this suspended position, while minor mandrel section 8 supports and brings to the surface the slips or other tail pipe assembly.

It is to be noted that it is not necessary to exert upward pressure on packing element 7 by lower packer seat 13 during the retrieving of the element, hence there is no tendency to re-set the packer as it is being retrieved.

In the modified form shown in Figure IV metal insert 13 is provided with an inner annular projection 13*b* for engagement with interfering shoulder 11 of collar 10 on mandrel 6. In this form of construction I am able to eliminate traveling ring 12 entirely, which modification enables me to produce my packer more simply and economically.

What I claim is:

1. A well packer for insertion in a pipe string comprising major and minor telescoping mandrels; means for limiting separating movement between said mandrels; opposed packer seats on the mandrels spaced from the inner mutually engaging ends of said mandrels; a resilient packer element disposed about the packer between said seats, said element having a central bore adapted to freely receive the major mandrel as said mandrels are telescoped together, and said element being fixed at one end to the packer seat on the minor mandrel and having an internal abutment in its free end; and an annular shoulder around the inner end of the major mandrel adapted to engage said internal abutment in the element and forcibly elongate said element as said mandrels are moved apart.

2. A well packer for insertion in a pipe string comprising two telescoping sections, the first section having a first packer seat and having a major mandrel extending therebeyond and said mandrel having an annular shoulder at its outer end, the second section having a second packer seat and having a minor mandrel extending therebeyond, said minor mandrel telescoping into said major mandrel; a resilient packer element disposed about said packer between said seats, the element being fixed at one end to said second seat and having a bore of larger diameter than said major mandrel whereby as said sections are telescoped together the major mandrel will slide into said bore and underlie said element and said seats will longitudinally compress said element; and an abutment in said bore at the unfixed end of said element whereby as the sections are moved apart the major mandrel will withdraw from said bore and said shoulder will engage with said abutment so that upon further separation of said sections said element will be forcibly elongated.

CECIL H. SWEET.

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