Dec. 6, 1955 L. W. HENSHAW 2,725,941

SPECIAL TOOL OPEN HOLE PACKER

Filed April 6, 1953

3 Sheets-Sheet 1

Fig. 1

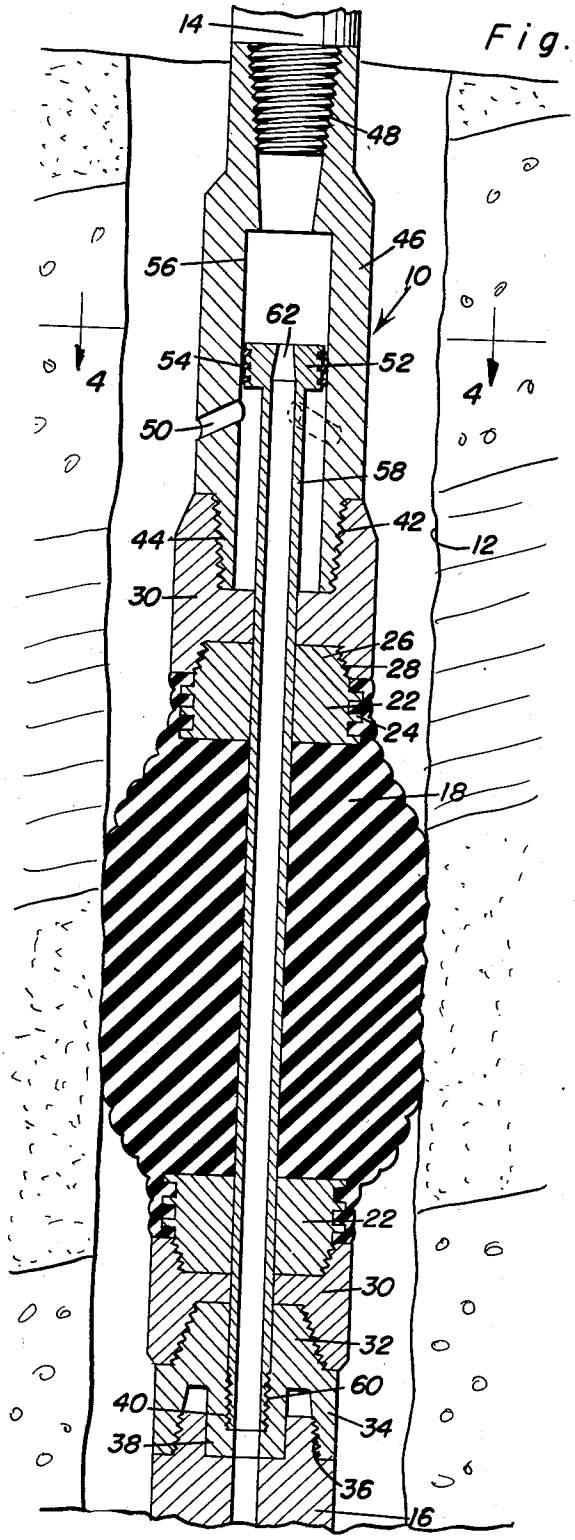
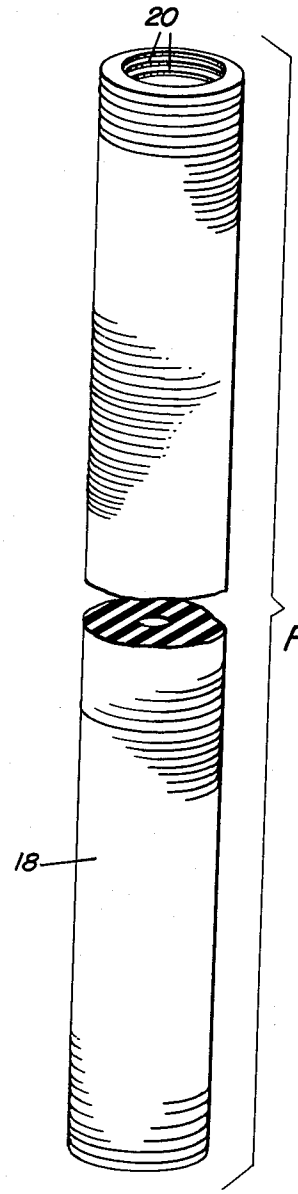


Fig. 6



Langford W. Henshaw

INVENTOR.

BY Clarence A. O'Brien and Harvey B. Jacobson

Attorneys

Dec. 6, 1955 L. W. HENSHAW 2,725,941

SPECIAL TOOL OPEN HOLE PACKER

Filed April 6, 1953 3 Sheets-Sheet 2

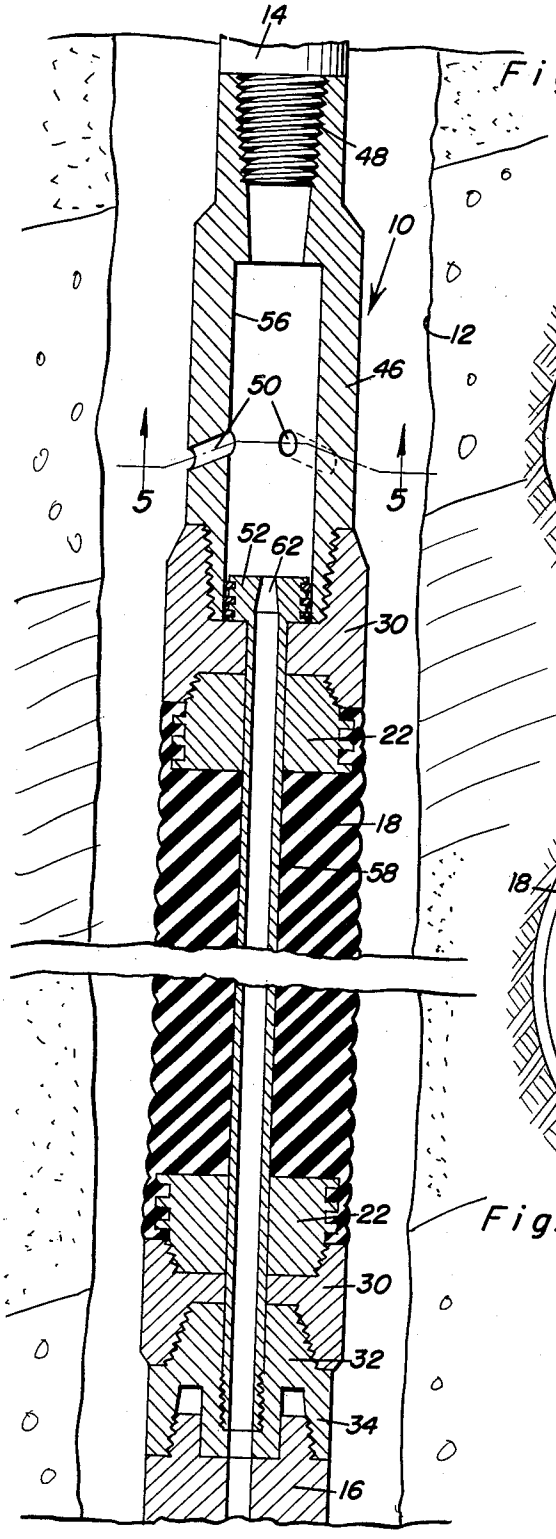
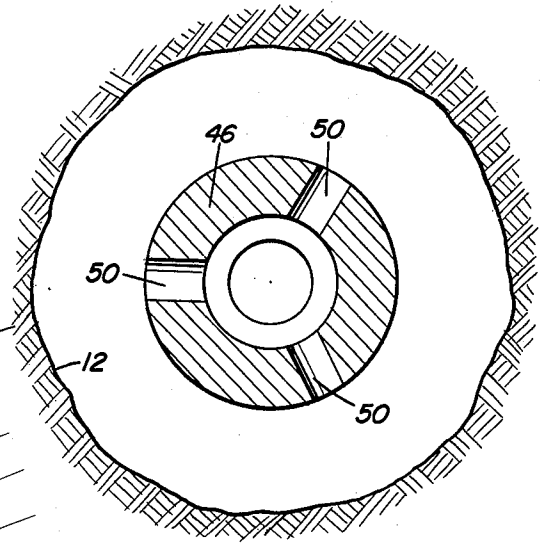


Fig. 2

Fig. 5



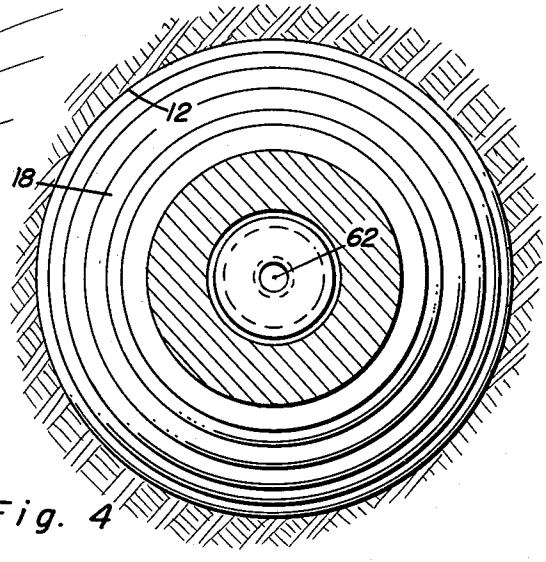


Fig. 4

Langford W. Henshaw

INVENTOR.

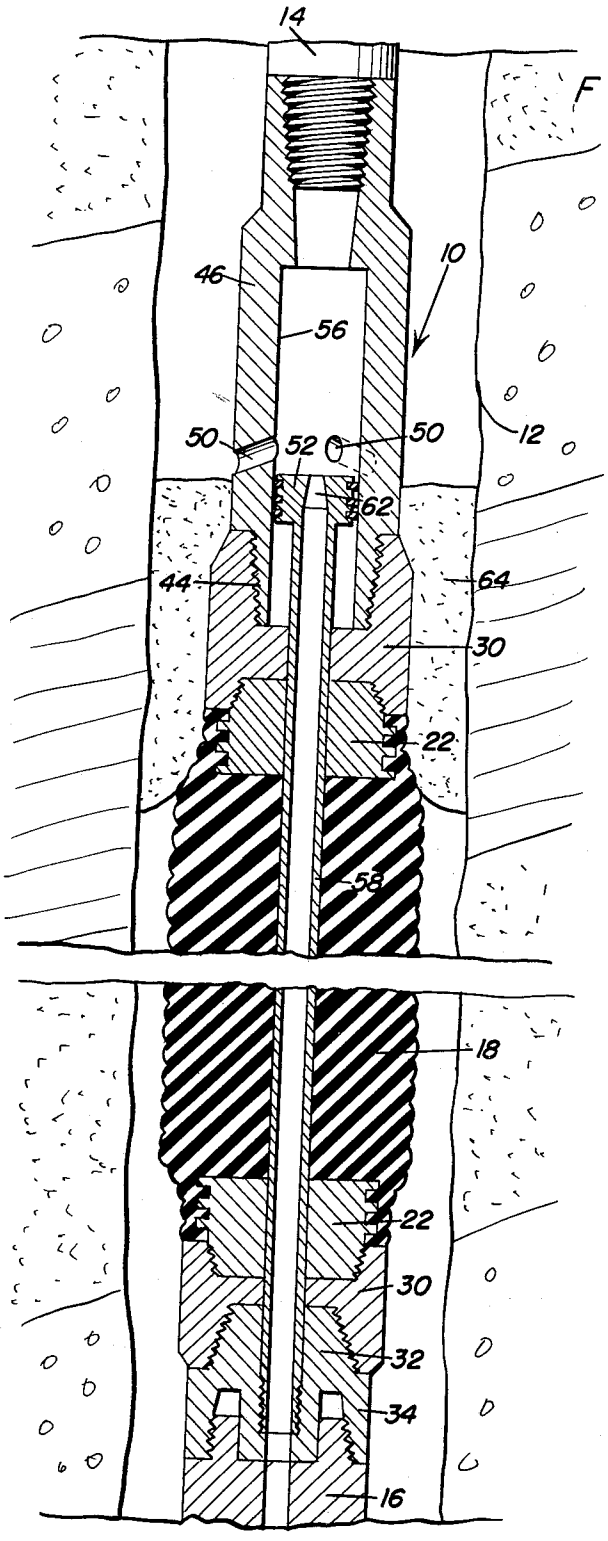
BY Clarence A. O'Brien and Harvey B. Jacobson
Attorneys

Dec. 6, 1955 L. W. HENSHAW 2,725,941

SPECIAL TOOL OPEN HOLE PACKER

Filed April 6, 1953 3 Sheets-Sheet 3

Fig. 3



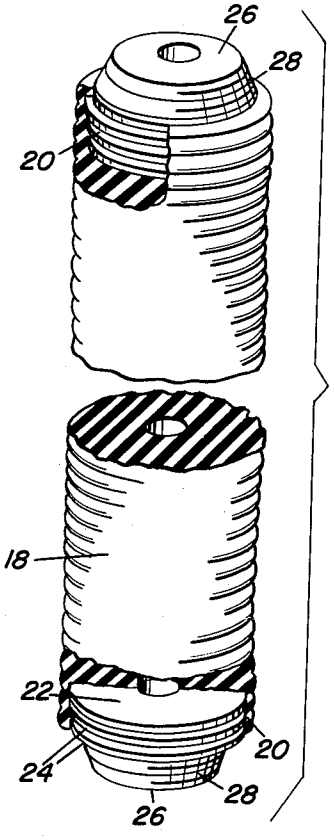


Fig. 7

Langford W. Henshaw

INVENTOR.

BY Clarence A. O'Brien and Harvey B. Jacobson

Attorneys

United States Patent Office 2,725,941
Patented Dec. 6, 1955

2,725,941

SPECIAL TOOL OPEN HOLE PACKER

Langford W. Henshaw, Odessa, Tex.

Application April 6, 1953, Serial No. 347,011

3 Claims. (Cl. 166—184)

This invention comprises novel and useful improvements in a special tool open hole packer and more specifically pertains to a well packer having a novel and improved construction whereby sediment and other matter collecting upon the top of the packer when the latter is in sealing position in a well bore may be removed and washed away to facilitate the removal of the packer from the bore.

The principal object of this invention is to provide a well packer having provision therein for removing an accumulation of dirt and other material upon the top of the packer to thereby facilitate the removal of the packer from the well bore.

A further important object of the invention is to provide an improved means for securing the sealing element of a well packer to the rest of the assembly.

A still further object of the invention is to provide an improved well packer having provision to enable the continuous circulation of drilling fluid through the drilling tube and well bore as the packer is lowered into the bore, or removed therefrom.

A further additional object of the invention is to provide a well packer having venting means to enable the passage of drilling fluid from the drilling tube into the well bore above the sealing element of the packer together with an automatic control means which, when the packer is in seated position in a well bore, will prevent the passage of such drilling fluid, and when the packer is being either raised or lowered into the well bore, will permit the flow of drilling fluid therethrough.

These together with other objects and advantages which will become subsequently apparent reside in the details of construction and operation as more fully hereinafter described and claimed, reference being had to the accompanying drawings forming a part hereof, wherein like numerals refer to like parts throughout, and in which:

Figure 1 is a fragmentary, vertical sectional view through a portion of a well bore showing the improved well packer in accordance with this invention, seated therein in sealed position;

Figure 2 is a view similar to Figure 1 but showing the packer and its parts in the position assumed as the packer is being lowered into or being withdrawn from a well bore;

Figure 3 is a view similar to Figures 1 and 2 but showing the position of the parts when the sealing engagement of the packer with well bore has been released and it is desired to withdraw the packer, a deposit of dirt or other material being shown disposed upon the packer and the arrows indicating the flow of drilling fluid for washing away this accumulation of dirt to facilitate withdrawal of the packer;

Figure 4 is a horizontal sectional view taken substantially upon the plane indicated by the section line 4—4 of Figure 1;

Figure 5 is a horizontal sectional view in detail taken substantially upon the plane indicated by the section line 5—5 of Figure 2;

Figure 6 is a perspective view, parts being broken away, of the laterally expansible sealing element forming a part of the packer; and

Figure 7 is a perspective view, parts being broken away, of the sealing element forming a part of the packer and showing the fastening elements by which the sealing element is secured to the other members of the packer assembly.

In the accompanying drawings, the numeral 10 designates generally the improved well packer forming the subject of this invention, while the numeral 12 indicates the well bore which may be either cased or uncased, as desired, and with which the improved well packer in accordance with this invention is to be employed.

As will be better apparent from a consideration of Figures 1–3, the well packer assembly 10 is adapted to be removably proposed between two adjacent portions of a drill tubing or drill pipe 14 and 16, although in some instances the packer may be disposed between the drill tubing and the drill bit or some other tool, if desired.

The packer assembly includes a sealing element which preferably comprises a sleeve 18 of a resilient, deformable material, such as rubber or the like, and which may be of any desired shape and size in accordance with the particular use for which the packer is to be employed. In some instances, the expansible sleeve 18 may be replaced with different sleeves of predetermined size and characteristics, in order to adapt the device for use in well bores of different sizes.

As shown more clearly in Figure 6, and indicated in Figure 7, the opposite ends of the sleeve 18 are provided with internal circumferential extending grooves 20 which are disposed in axially extending sockets in the opposite ends of the sleeve. A pair of collars 22 are provided, having annular external ribs or flanges 24 which are received in the grooves 20, whereby the collars are embedded in the ends of the sleeve.

It will thus be apparent that the collars 22 are embedded and thus are rigidly secured in the sleeve 18 and constitute means whereby the sleeve is detachably secured to the other elements of the packer assembly. The end portions of each of the collars 26 is provided with tapered external threads 28, these threaded extremities extending beyond the opposite ends of the sleeve 18.

A pair of connectors 30 are provided, each having tapered, internally threaded sockets at its opposite extremities. The upper connector has its lower end screw threadedly engaged upon the axially extending end 26 of the collar 22, while the lower connector 30 has its upper socket engaged with the lower collar 22 and has its internally threaded lower socket detachably receiving the upper tapered, externally threaded extremity 32 of a plug 34. The latter, in turn, is provided with an internally threaded lower socket 36 adapted to detachably receive the drill tubing portion 16, previously mentioned. Depending axially from the lower cap 34 is a central cylindrical portion 38 which is internally threaded as at 40 to provide a recess in axial alignment with the bore extending through the members 32, 30, 22, 18, 22, 26, and 30. Detachably secured in the internally threaded tapered upper socket 42 of the connector 30 is the externally threaded tapered lower extremity 44 of a cylinder 46 whose upper end is provided with a tapered internally threaded bore 48 adapted to receive the drill tubing portion 14 previously mentioned.

In the assembly, as so far described, it will now be apparent that a continuous open communication is provided between the tubing portions 14 and 16, through the well packer assembly 10.

The device as so far described, resembles a conventional well packer in that when connected as described and as shown in Figures 1–3, the drill tubing with the well packer

connected thereto is lowered into a well until the bottom of the drill tubing rests upon the well bottom whereupon the entire weight of the drill tubing will be placed upon the sleeve **18** through the collars **22** at opposite ends of the same, thereby causing the sleeve to expand laterally from the collapsed position of Figure 2 until the sleeve is in its sealing position as shown in Figure 1.

It frequently happens that after a packer has remained in a well bore for a considerable time, that dirt, sand, and the like accumulate upon the top surface of the packer, in the manner indicated in Figure 3, and thus prevent withdrawal of the packer when it is desired to remove the same. In order to overcome this difficulty and facilitate such withdrawal whereby the packer may be removed to facilitate further operations in the well bore, the improved construction in accordance with this invention is provided. This improvement consists of a plurality of ports, vents, or orifices **50** which connect the interior of the cylinder **46** with the well bore above the deformable sleeve **18**. These passages **50** permit the flow of drilling fluid down the drill tubing through the portion **14**, through the passages **50** and into the well bore, from whence it returns to the surface. A control means in the form of a piston **52**, which may have suitable sealing rings **54**, is disposed for relative axial sliding movement within the chamber **56** in the interior of the cylinder **46**, and thus controls the vents, ports, or orifices. The piston **52** is rigidly attached to the upper end of a tubular rod **58**, either by a detachable connection or by an integral construction, if desired. The rod **58** is slidably received in the members **46**, **30**, **22**, and **18**, and at its lower end is externally threaded, as at **60**, for secure detachable connection to the internally threaded portion **40** of the member **32**. Thus, the lower end of the tubular rod **58** is rigidly carried by the member **34** where it is freely slidable within the other members of the packer assembly as will be readily apparent from a comparison of Figures 1–3. The tubular rod **58** establishes a continuous communication between the drill tubing portions **14** and **16**, through a passage **62** in the piston **52**. The length of the tubular rod is so proportioned that the sleeve **18** is in its normal non-expanded position, as shown in Figure 2, the piston will be at the bottom of the chamber **56** whereby the ports **50** will be uncovered. In this position, it will be apparent that drilling fluid may be delivered downwardly through the drill tubing portion **14**, through the vents **50**, and thus up the well bore; and also, through tubular rod **58** and the drill tubing portion **16** to the bottom end of the drill tubing and thus return upwardly about the tubing and packer assembly. However, after the drill tubing has been set in place, and the weight of the same is applied to the sealing element or sleeve **18**, causing the same to expand, it will be apparent that the cylinder portion **46** will move downwardly relative to the stationary rod **58**, and thus cause the piston portion **52** to move above the ports **50**, thereby closing these ports to the drilling fluid from the drill tubing **14**, as clearly shown in Figure 1.

It will be apparent that as soon as the drill tubing is lifted, the weight of the same is removed from the sealing element **18**, the latter will contract to its original position, as shown in Figure 2 or Figure 3, whereby the well packer is ready for withdrawal from the well bore. However, if there is an accumulation of sand or other material upon the top of the packer, as shown in Figure 3, the presence of the latter will obstruct the upward passage of the well packer and heretofore has prevented satisfactory withdrawal of the same. By the present construction however, as soon as the packer radially collapses as for example in the position shown in Figure 3, the resultant elongation of the packer assembly **10** will cause relative movement of the piston **52** below the vents **50**, as shown in Figure 3. In this position, drilling fluid or other liquids, or gases, may be pumped down the drill tubing portion **14**, will pass through the vents **50** and circulating about and impinging upon the material **64**, as shown in Figure 3, will scour the surface of the same and wash away such material. At the same time, the circulating material will pass downwardly through the tubular rod **58** to the lower end of the drill tubing, and will attack the accumulation **64** from the underside of the same. Thus, this plug of material will be washed way thereby permitting easy withdrawal of the packer.

From the foregoing, the construction and operation of the device will be readily understood and further explanation is believed to be unnecessary. However, since numerous modifications and changes will readily occur to those skilled in the art, it is not desired to limit the invention to the exact construction shown and described, and accordingly all suitable modifications and equivalents may be resorted to, falling within the scope of the appended claims.

What is claimed as new is as follows:

1. A well packer comprising a resilient, axially and laterally deformable sleeve, upper and lower connecting means for securing opposite ends of said sleeve in detachable engagement with adjacent portions of a drill tubing and in communication therewith, said upper connecting means including a cylinder having a valve port in its wall intermediate the ends thereof and establishing communication between the interior and exterior of the cylinder, said valve port being positioned for directing fluid from the interior of the cylinder downwardly towards the sleeve to wash away any accumulation of material thereon, a tubular rod extending axially through said sleeve and having its interior in constant communication with the upper and lower connecting means and having its lower end fixedly secured in said lower connecting means, a piston on said rod slidable in said cylinder past said valve port for controlling flow through the latter, said rod having portions relatively movable in said cylinder and said sleeve upon axial deformation of the latter, said piston having means establishing communication between the interiors of the rod and the cylinder.

2. The combination of claim 1 wherein one of said connecting means includes a collar embedded in an end of said sleeve and having a threaded end axially extending from said sleeve.

3. The combination of claim 1 wherein each of said connecting means includes a collar embedded in the end of said sleeve and has a threaded end axially extending from said sleeve.

References Cited in the file of this patent

UNITED STATES PATENTS

1,648,377	Crowell	Nov. 8, 1927
2,093,129	Johnston	Sept. 14, 1937
2,239,150	Halliburton	Apr. 22, 1941
2,365,639	Holmes et al.	Dec. 19, 1944
2,657,751	Johnston	Nov. 3, 1953
2,660,247	Sweet	Nov. 24, 1953
2,663,307	Birdwell	Dec. 22, 1953
2,672,934	Miner	Mar. 23, 1954