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R. L. ANDERSON ET AL

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SEATING ARRANGEMENT FOR SUBSURFACE PUMPS

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FIG. 1.

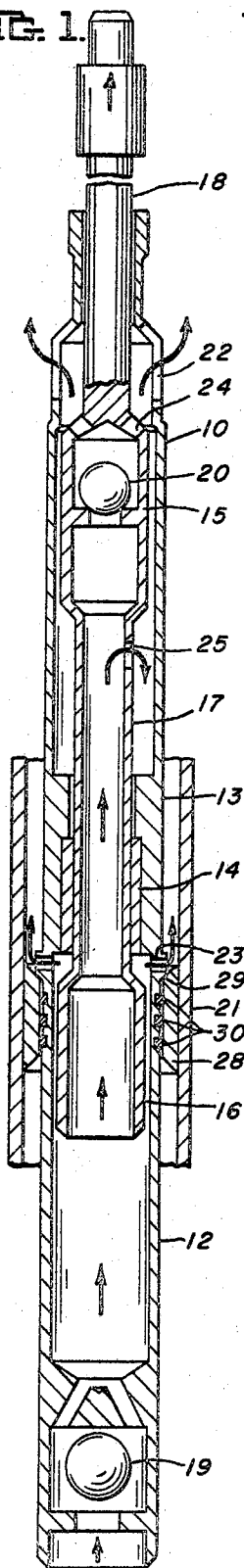


FIG. 2.

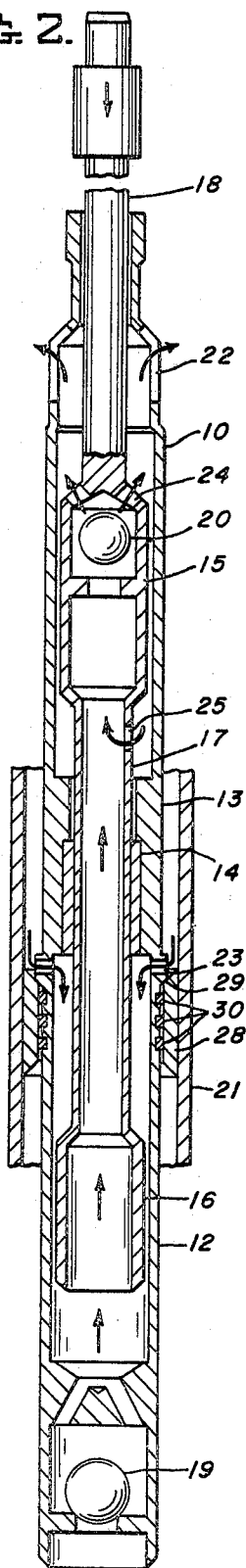
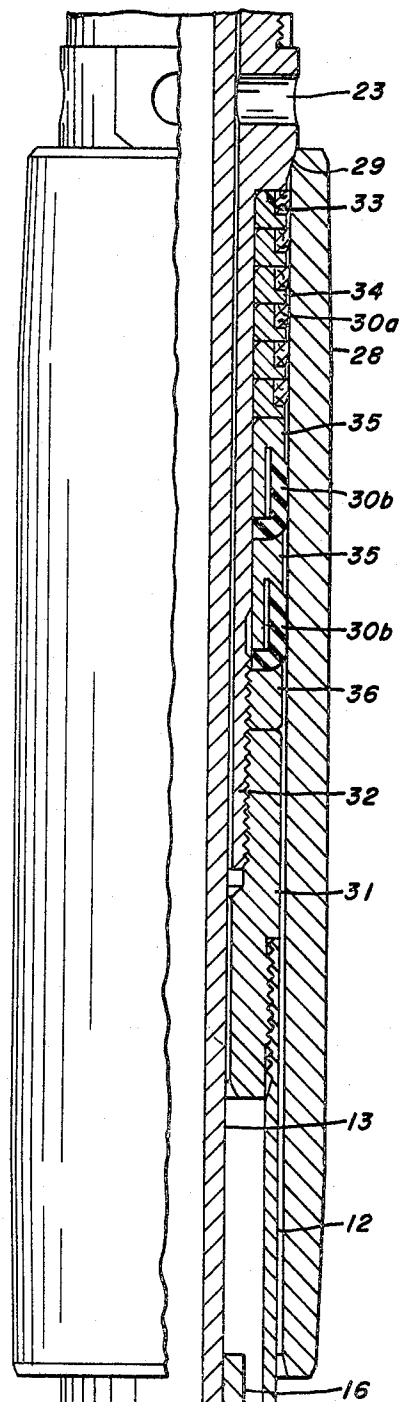


FIG. 3.



INVENTORS.
ROBERT L. ANDERSON &
JOHN M. ROHRIG
By *Halter P. Wood*
Attorney

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SEATING ARRANGEMENT FOR
SUBSURFACE PUMPSRobert L. Anderson and John M. Rohrig, Huntington
Beach, Calif., assignors to United States Steel Corpora-
tion, a corporation of Delaware

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3 Claims

ABSTRACT OF THE DISCLOSURE

An arrangement for seating a subsurface oil well pump to prevent foreign material from accumulating around the pump barrel and interfering with removal of the pump. Barrel has vent ports through which foreign material discharges as the pump plunger makes an upstroke. Seat is located immediately below these ports where it blocks off the space below. Consequently foreign material returns to the barrel through the ports as the plunger makes a downstroke.

This invention relates to an improved seating arrangement for a high-volume subsurface pump.

A conventional high-volume pump used in oil wells includes upper and lower barrels and respective plungers movable up and down within the barrels. The well tubing contains a seat on which the lower barrel rests to hold the pump at the proper depth. The lower barrel has vent ports near its upper end to prevent fluid from becoming trapped above the plunger. One difficulty is that foreign material, such as sand, discharges through the vent ports along with the fluid and accumulates in the space below the ports between the lower barrel and tubing. Such accumulations interfere with removal of the pump from the tubing, as is occasionally necessary.

An object of our invention is to provide, for a pump of the foregoing type, an improved seating arrangement which prevents foreign material from accumulating and interfering with removal of the pump.

A more specific object is to provide an improved seating arrangement in which the seat is located immediately below the vent ports, where it blocks off the space therebelow and prevents foreign material from accumulating.

In the drawing:

FIGURE 1 is a partially diagrammatic vertical sectional view of a subsurface pump seated in accordance with our invention, showing the position of the parts during an upstroke;

FIGURE 2 is a similar view, but showing the position of the parts during a downstroke; and

FIGURE 3 is a vertical sectional view showing our actual preferred construction of the vent ports and seat.

FIGURES 1 and 2 show diagrammatically a high volume subsurface pump which includes upper and lower barrels 10 and 12, a connector 13 and liner 14 between the barrels, and respective upper and lower plungers 15 and 16 movable up and down within the barrels. A tubular connector 17 joins the two plungers and fits closely within the liner 14. A rod 18 extends upwardly from the upper plunger to be connected to the usual sucker rod string (not shown). The lower barrel 12 and the upper plunger 15 carry the usual standing valve 19 and traveling valve 20 respectively. The pump is housed within a tubing 21. The upper barrel 10 has delivery ports 22. The lower barrel 12 has vent ports 23. The upper plunger 15 has ports 24 above the traveling valve 20. The connector 17 has ports 25 within the upper barrel 10.

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As FIGURE 1, the standing valve 19 opens during an upstroke of the plungers 15 and 16, while the traveling valve 20 closes. Fluid is drawn from the well into the lower barrel 12 and through the lower plunger 16, connector 17 and ports 25 into the upper barrel 10. The upper plunger 15 forces fluid from the upper portion of the upper barrel 10 through the delivery ports 22 into the tubing 21 and thence to the surface. Any fluid which reaches the portion of the lower barrel 12 above the plunger 16 escapes into the tubing through the vent ports 23, as indicated by arrows in FIGURE 1.

As FIGURE 2 shows, the traveling valve 20 opens during a downstroke of the plungers, while the standing valve 19 closes. Descent of the lower plunger 16 forces fluid from the lower barrel 12 through the plunger 16, connector 17, plunger 15, traveling valve 20 and ports 24 into the portion of the upper barrel 10 above plunger 15. Descent of the upper plunger 15 forces fluid from the lower portion of the upper barrel 10 through ports 25, connector 17, plunger 15, traveling valve 20 and ports 24 into the portion of the upper barrel above plunger 15. A fraction of this fluid is forced through the delivery ports 22 into the tubing 21 and thence to the surface. Fluid which was forced from the lower barrel 12 through the vent ports 23 during the preceding upstroke may return to the lower barrel through these ports.

Pumps of the foregoing construction and operation are well known. Hence we have not shown or described the pump in greater detail.

In accordance with our invention, we place a seating shoe 28 within the tubing 21. The outside of the lower barrel 12 has a downwardly facing shoulder 29 which is located immediately below the vent ports 23 and rests on this shoe. The lower barrel carries a series of sealing rings 30 below the shoulder. These rings engage the inside of the seating shoe 28 to furnish a seal therebetween. Foreign material may discharge through the vent ports 23 during an upstroke of plunger 16, but the sealing rings 30 and shoe 28 prevent such material from reaching the space between the lower barrel 12 and tubing 21. Instead this material is forced upwardly as indicated by arrows in FIGURE 1. During the ensuing downstroke of plunger 16, the material returns through the vent ports 23 to the lower barrel 12, as indicated by arrows in FIGURE 2.

FIGURE 3 shows our actual preferred seat construction. The lower barrel 12 includes a bushing 31 fixed to the upper end of its working portion and a mandrel 32 fixed to the bushing. The vent ports 23 and shoulder 29 are formed on the mandrel 32. The mandrel has a second downwardly facing shoulder 33 below shoulder 29. A plurality of metal spacer rings 34 encircle the portion of the mandrel of reduced diameter below the second shoulder 33 and support friction rings 30a. A pair of resilient cups 30b encircle the mandrel below the spacer rings 34 and are held in position by additional spacers 35 and a nut 36 threadably engaged with the mandrel immediately below the bushing 31. The friction rings 30a and cups 30b contact the inside of the shoe 28.

From the foregoing description it is seen that the present invention affords a simple effective arrangement for preventing foreign material from accumulating around the lower barrel of a high-volume pump and interfering with removal of the pump. With the seat located immediately below the vent ports, the space around the lower barrel is blocked off and there is no opportunity for foreign material to reach this space.

While we have shown and described only a single embodiment of our invention, it is apparent that modifications may arise. Therefore, we do not wish to be limited to the disclosure set forth but only by the scope of the appended claims.

We claim:

1. The combination, with a subsurface pump which is of the high-volume type and includes upper and lower barrels and respective plungers within said barrels, said lower barrel having a vent port near its upper end, and a tubing in which said pump is found, there being a space between the outside of said lower barrel and the inside of said tubing, of an improved arrangement for seating said pump in said tubing, said seating arrangement including a shoe mounted in said tubing, a downwardly facing shoulder formed on said lower barrel immediately below said port, said shoulder resting on said shoe, and sealing means encircling said barrel below said shoulder and engaging the inside of said shoe, said shoe and sealing means blocking off the space between said lower barrel and tubing and thereby preventing foreign material which discharges through said port from accumulating in this space.

2. A combination as defined in claim 1 in which said lower barrel includes a working portion, a bushing fixed

to the upper end of said working portion, and a mandrel fixed to said bushing, said port and shoulder being formed on said mandrel.

3. A combination as defined in claim 2 in which said mandrel has a second downwardly facing shoulder below said first-named shoulder, and said sealing means includes friction rings, resilient cups and spacers encircling said mandrel below said second shoulder.

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ROBERT M. WALKER, Primary Examiner

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