Aug. 18, 1953 E. E. STEVENSON 2,649,328

DEVICE FOR INSTALLING OR REMOVING STANDING VALVES

Filed March 23, 1951

FIG. 1.

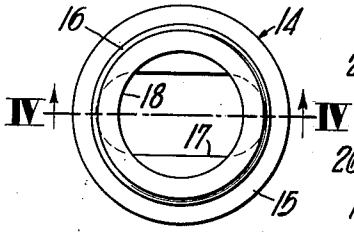


FIG. 3.

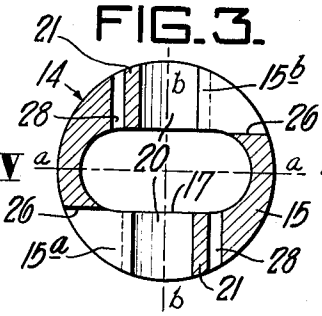


FIG. 6.

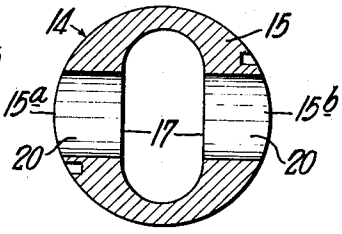


FIG. 2.

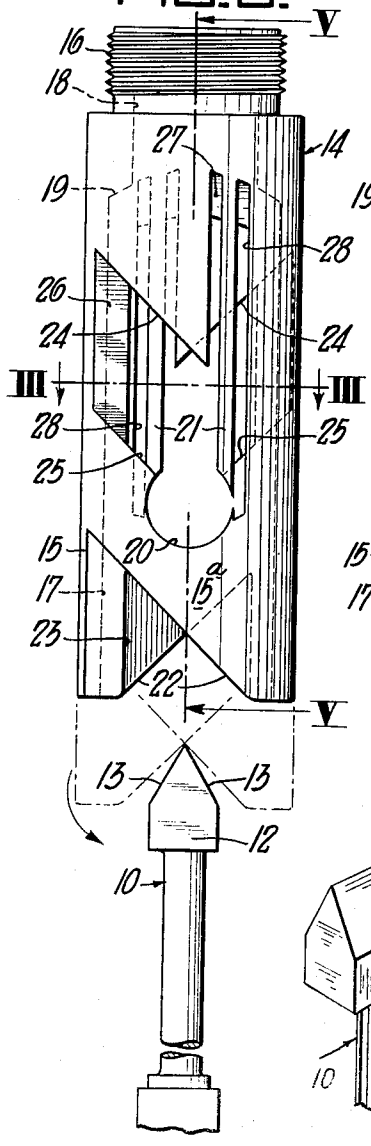


FIG. 4.

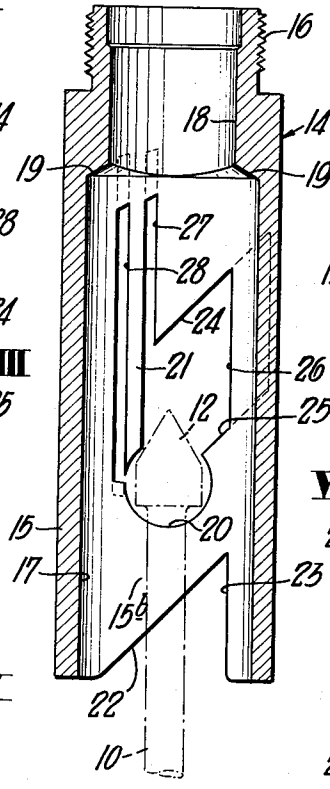


FIG. 5.

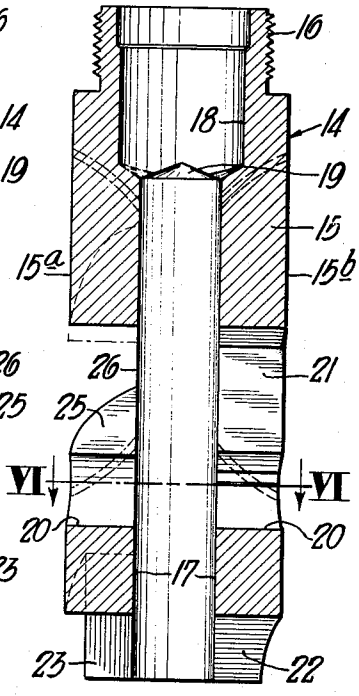


FIG. 7.

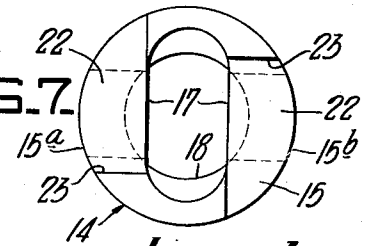
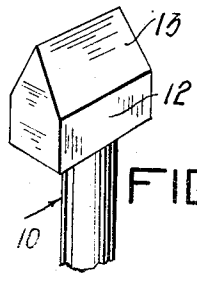


FIG. 8.



Inventor:
EDWARD E. STEVENSON,
by: Donald G. Dalton
his Attorney

Patented Aug. 18, 1953

2,649,328

UNITED STATES PATENT OFFICE

2,649,328

DEVICE FOR INSTALLING OR REMOVING STANDING VALVES

Edward E. Stevenson, Whittier, Calif., assignor to United States Steel Corporation, a corporation of New Jersey

Application March 23, 1951, Serial No. 217,223

6 Claims. (Cl. 294—86)

1

This invention relates to improved devices for installing or removing standing valves of stationary barrel subsuface pumps.

As understood in the subsurface pump art, a standing valve is a valve whose body or cage is situated in a fixed position within a well. In pumps which have a stationary barrel and a reciprocable piston or plunger, the standing valve cage is removably seated near the bottom of the barrel below the usual stroke of the reciprocable element. It is common to equip this cage and the reciprocable element with cooperating means to engage each other for supporting the standing valve as it is raised or lowered through the well tubing or casing. The means carried by the valve cage commonly is an upstanding spindle which has an enlarged head. The lower end of the reciprocating element of the pump carries a gripper which is adapted to support this head when the element is lowered below the usual bottom of its downstroke and turned approximately a quarter revolution, and is adapted to releasse this head when the element is turned the other way. To prevent a standing valve from accidentally dropping free of the gripper as the valve is being raised or lowered, it is known in the art to equip the gripper with spring means which positively interlock the gripper and spindle until they are released intentionally.

An object of the present invention is to provide improved grippers which have such spring means and yet are of simplified one-piece construction.

A further object of the invention is to provide improved grippers which have springs formed integrally with the side walls, thereby eliminating the need for special inserts and adapters commonly used in such grippers.

In accomplishing these and other objects of the invention, I have provided improved details of structure, a preferred form of which is shown in the accompanying drawings, in which:

Figure 1 is a top plan view of an improved gripper embodying features of the present invention;

Figure 2 is a side elevational view of the gripper and of the spindle of a standing valve cage;

Figure 3 is a horizontal sectional view taken substantially on line III—III of Figure 2;

Figure 4 is a vertical sectional view taken substantially on line IV—IV of Figure 1;

Figure 5 is a vertical sectional view taken substantially on line V—V of Figure 2;

Figure 6 is a horizontal sectional view taken substantially on line VI—VI of Figure 5;

Figure 7 is a bottom plan view; and

2

Figure 8 is a perspective view of the spindle and head which are attached to the standing valve cage.

The drawing shows a spindle 10 adapted to be fixed to the top of a standing valve cage. The upper end of the spindle carries a T-shaped head 12, which has upwardly directed cam faces 13. A cooperating gripper 14, hereinafter described in detail, is adapted to be fixed to the bottom of the reciprocable element of the pump. Apart from the gripper, the pump can be of any standard or desired construction which has a stationary barrel and a reciprocable piston or plunger, and therefore is not shown nor described in detail.

In accordance with the present invention, the gripper 14 is formed of an integral cylindrical body 15, the upper end of which is of reduced diameter and carries external screw threads 16 adapted to engage a mating threaded portion on the reciprocable element of the pump. Body 15 contains a longitudinal passage 17 of oblong cross section that extends from its lower end to a point somewhat below its upper end and a passage 18 of circular cross section that forms a continuation of passage 17 and extends through the upper end of the body. The body has downwardly facing shoulders 19 at the top of its passage 17. A horizontal section through the passage 17 has major and minor axes of symmetry *a* and *b* which are perpendicular to each other, as indicated in Figure 3.

It is seen that two of the opposite side walls 15*a* and 15*b* of body 15 form the elongated sides of the oblong passage 17 (Figure 3). Each of these side walls contains a series of cut-outs which define the functional parts of the gripper. The cut-outs in the two walls are alike, so that a description of one series serves for both.

As Figure 4 shows, the cut-outs in the side wall 15*b* form an upwardly facing shoulder 20 for supporting one end of the head 12 of spindle 10, a means for guiding the head between passage 17 and this shoulder, and an integral leaf spring 21 overhanging the shoulder for interlocking the head therewith. The guiding means includes a notch which extends from the lower end of the body and whose edges form a sloping cam face 22 and a vertical face 23. The guiding means further includes a cut-out which is spaced above said notch and whose edges form upper and lower helical faces 24 and 25 respectively and a vertical face 26. Said helical faces are approximately parallel to each other and to the cam face 22. The two vertical faces 23 and 26 lie

approximately in the same plane. The cut-out which forms shoulder 20 is situated at the lower extremity of the lower helical face 25. A pair of elongated vertical slits 27 and 28 define the leaf spring 21. Slit 27 extends upwardly from the lower extremity of the upper helical face 24, while slit 28 extends upwardly from above shoulder 20. Thus the extremity of the leaf spring overhangs said shoulder. It is seen that the cut-out which forms the two helical faces 24 and 25, vertical face 26 and one face of leaf spring 21 is an approximately diamond-shaped parallelogram, broken at its lower corner by the cut-out which forms the shoulder 20.

Figure 3 clearly shows the cross-sectional configuration of the springs 21. The dimension of each spring parallel to the major axis of symmetry *a* of a horizontal section through the passage 17 is relatively thin. The dimension of each spring parallel to the minor axis *b* of the same section is much thicker. Consequently these springs flex much more readily in a direction parallel to the major axis *a* than in a direction parallel to the minor axis *b*. When these springs engage the head 12, as hereinafter described, the resultant forces flex the springs approximately in the direction of the circumference of the cylindrical gripper body 15. For convenience I refer to the direction in which these springs flex as "circumferential."

As Figure 2 shows, the cam face and the helical faces in the two side walls slope in opposite directions, so that the body appears the same viewed from either side. This arrangement places the two leaf springs 21 at opposite sides of their shoulders 20.

In operation, assume first that the standing valve and the reciprocable element of the pump are in the positions they normally occupy in a well and that it is desired to bring the standing valve to the surface. The reciprocable element of the pump is lowered to move the gripper 14 over the spindle 10. If the oblong passage 17 happens to be aligned with head 12, the head freely enters said passage. Otherwise the cam faces 13 on head 12 engages the cam faces 22 on the gripper and rotate the gripper and the reciprocable element counterclockwise, as viewed from above, until passage 17 is so aligned. The gripper moves down over the head until its downwardly facing shoulders 19 abut the top of the head. Next the reciprocable element and the gripper are rotated approximately a quarter revolution clockwise, as viewed from above, and raised. The upper helical faces 24 engage the cam faces 13 and guide the head toward leaf springs 21. When the head abuts these springs, the latter flex circumferentially toward slits 28 and allow shoulders 20 to move into engagement with the underside of the head, after which the springs flex back to their original position. Further upward movement of the gripper lifts the standing valve from its seat with head 12 supported on shoulders 20. Leaf springs 21 positively interlock the head with the gripper. The head and gripper can be disengaged manually when they reach the surface.

Assume now that it is desired to place a standing valve in a well. The valve is engaged manually with the gripper so that head 12 is supported on shoulders 20 in the same fashion as before. The standing valve is lowered into the well until it seats. Then the gripper is rotated approximately a quarter revolution counterclockwise, as viewed from above, and lowered a little

farther. The cam faces 13 engage springs 21 and flex them so that shoulders 20 ride free of the head. Further movement of the gripper carries it to a position in which the head again is aligned with the oblong passage 17, whereupon the gripper can move freely away from the head and pumping can commence.

From the foregoing description it is seen that the present invention furnishes a spring-type gripper formed as a single unitary part. The springs merely are cut from the side walls and yet function effectively to interlock the gripper with the standing valve. There is no need for adapters for attaching the gripper to the reciprocable elements, but instead these parts can be attached directly.

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

I claim:

1. A gripper of the class described formed of a cylindrical body which contains a longitudinal passage of oblong cross-section, the two side walls of the body which form the elongated sides of said passage containing cut-outs which define upwardly facing shoulders to support a T-head, means for guiding the head between said passage and said shoulders, and circumferentially flexible integral leaf springs overhanging said shoulders for interlocking the head therewith.

2. A gripper of the class described formed of a cylindrical body which has an integral externally screw-threaded portion at its upper end and contains a longitudinal passage of oblong cross-section extending from its lower end to a point somewhat below its upper end and terminating in downwardly facing shoulders, the two side walls of the body which form the elongated sides of said passage containing cut-outs which define upwardly facing shoulders to support a T-head, means for guiding the head between said passage and said upwardly facing shoulders on rotation of the body, and circumferentially flexible integral leaf springs overhanging said upwardly facing shoulders for interlocking the head therewith.

3. A gripper of the class described formed of a cylindrical body which contains a longitudinal passage of oblong cross-section, the two side walls of the body which form the elongated sides of said passage containing cut-outs which define upwardly facing shoulders to support a T-head, helical faces for guiding the head between said passage and said shoulders on rotation of the body, and circumferentially flexible integral leaf springs overhanging said shoulders for interlocking the head therewith, the lower ends of these side walls containing notches whose edges form cam faces for guiding the body into a position in which said passage is aligned with the head.

4. A gripper of the class described formed of a cylindrical body which has an integral externally screw-threaded portion at its upper end and contains a longitudinal passage of oblong cross-section extending from its lower end to a point somewhat below its upper end and terminating in downwardly facing shoulders, the two sides of the body which form the elongated sides of said passage containing cut-outs which define upwardly facing shoulders to support a T-head, helical faces for guiding the head between said passage and said upwardly facing shoulders on

rotation of the body, and circumferentially flexible integral leaf springs overhanging said upwardly facing shoulders for interlocking the head therewith, the lower ends of these side walls containing notches whose edges form cam faces for guiding the body into a position in which said passage is aligned with the head.

5. A gripper of the class described formed of a cylindrical body which contains a longitudinal passage of oblong cross-section, the two side walls of the body which form the elongated sides of said passage containing cut-outs which define upwardly facing shoulders to support a T-head, cut-outs forming approximately diamond-shaped parallelograms broken at their lower corners by said first named cut-outs and defining helical faces for guiding the head between said passage and said shoulders on rotation of the body, slits extending upwardly from said first and second named cut-outs defining circumferentially flexible integral leaf springs overhanging said shoulders for interlocking the head therewith, and notches in their lower ends whose edges form cam faces for guiding the body into a position in which said passage is aligned with the head.

6. A gripper of the class described formed of a cylindrical body which has an integral externally screw-threaded portion at its upper end

and contains a longitudinal passage of oblong cross-section extending from its lower end to a point somewhat below its upper end and terminating in downwardly facing shoulders, the two sides of the body which form the elongated sides of said passage containing cut-outs which define upwardly facing shoulders to support a T-head, cut-outs forming approximately diamond-shaped parallelograms broken at their lower corners by said first named cut-outs and defining helical faces for guiding the head between said passage and said upwardly facing shoulders on rotation of the body, slits extending upwardly from said first and second named cut-outs defining circumferentially flexible integral leaf springs overhanging said upwardly facing shoulders for interlocking the head therewith, and notches in their lower ends whose edges form cam faces for guiding the body into a position in which said passage is aligned with the head.

EDWARD E. STEVENSON.

References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
1,717,497	Davis	June 18, 1929
2,382,173	Renouf	Aug. 14, 1945