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 [21] Appl. No. **889,079**
 [22] Filed **Dec. 30, 1969**
 [45] Patented **June 15, 1971**
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3,269,463 8/1966 Page, Jr. 137/519.5 X
 3,279,545 10/1966 Page, Jr. 137/533.11 X

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[54] **FLOW CONTROL VALVE FOR WELLS**
8 Claims, 3 Drawing Figs.

[52] U.S. Cl. **137/454.2,**
 137/519.5, 166/224

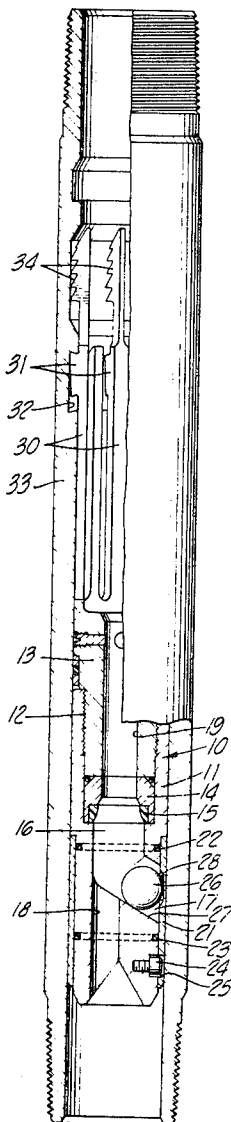
[51] Int. Cl. **F16k 15/04**

[50] Field of Search 137/454.2,
 519.5, 533.11, 533.13, 533.15; 166/224

[56] **References Cited**
UNITED STATES PATENTS

2,638,308 5/1953 Kell 137/519.5

ABSTRACT: A tubular body for use in a well has a downward facing seat engaged by a ball which moves upward out of an inclined pocket on one side of the body. An offset axial flow passage on the other side of the body communicates with a chamber between the pocket and the seat, so that the ball is lifted to contact the seat by aspirator action upon excessive rate of flow through the passage. A sleeve encircling a portion of the body forms an end wall of the inclined pocket and seal means between the body and the sleeve above and below the pocket prevent leakage. Latches on spring fingers on the body hold the device in position within a well pipe.



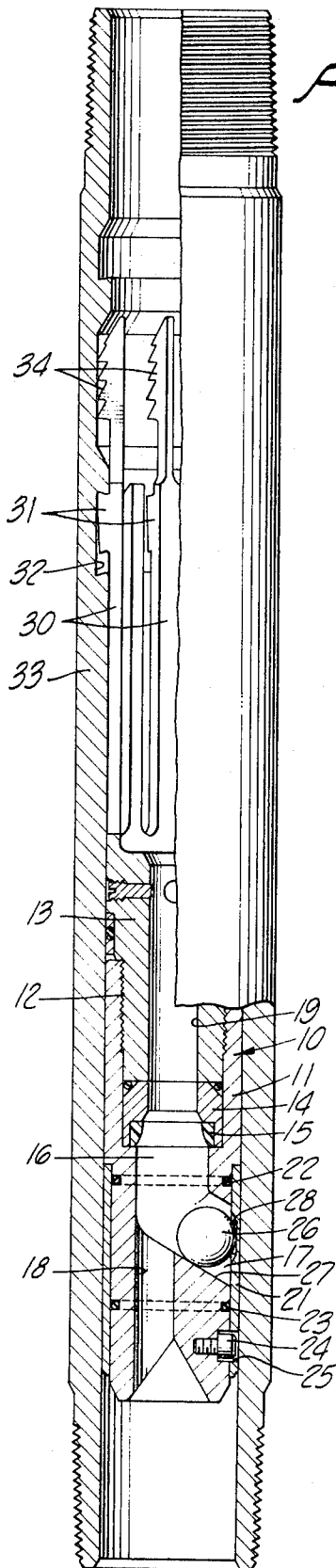


FIG. 1.

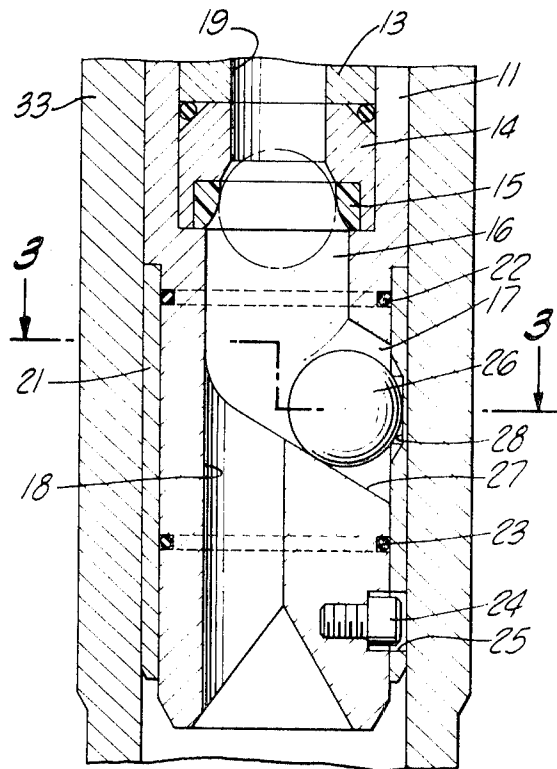


FIG. 2.

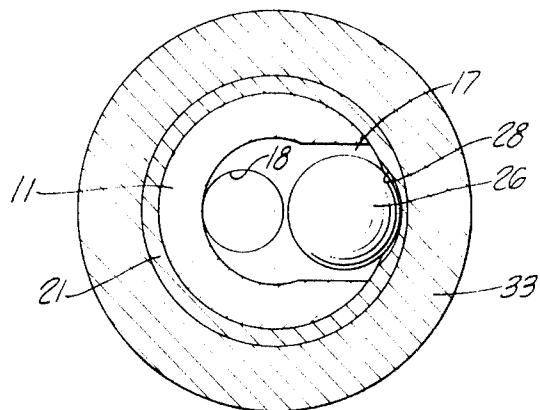


FIG. 3.

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FLOW CONTROL VALVE FOR WELLS

This invention relates to flow control valves for wells and is particularly directed to improvements in a ball check valve for shutting off flow of well fluid when the rate of flow exceeds a predetermined maximum.

In the John S. Page, Jr. U.S. Pat. No. 3,269,463, there is shown an insert-type valve seat assembly which may be lowered through a tubing string and latched into position above a ball mounted in an offset pocket. The pocket is contained in a special landing nipple positioned between two sections of the tubing. The pocket is contained in a laterally extending housing which projects from one side of the landing nipple. The ball is moved upward into contact with the downward facing seat under certain conditions of flow and pressure. In the device of the present invention however, the ball and the offset pocket are both contained on the body which is insertable through the tubing.

Furthermore, it is an important object of this invention to provide a flow control valve assembly for wells which operates to prevent upward flow of well fluid whenever the velocity of the flow exceeds a predetermined maximum, and substantially independently of the well pressure.

In the drawings:

FIG. 1 is a sectional elevation showing a preferred embodiment of the invention installed in a well pipe.

FIG. 2 constitutes an enlargement of lower portion of FIG. 1.

FIG. 3 is a sectional plan view taken substantially on the lines 3-3 as shown in FIG. 2.

Referring to the drawings, the flow control device generally designated 10 includes a tubular body 11 connected by threads 12 to a body extension 13. A central annular seat 14 is clamped between the parts 11 and 13 and carries a nonmetallic annular insert 15. A chamber 16 in the body 11 below the seat 14 communicates with an inclined pocket 17 positioned at one side of the body. An offset axial flow passage 18 is provided on the other side of the body and this passage 18 extends from the lower end of the body to the chamber 16. Flow of well fluid takes place upwardly through the passage 18, chamber 16 and through the interior of the seat 14 and through the central axial passage 19 in the body extension 13.

A cylindrical sleeve 21 is telescopically mounted on the lower portion of the body 11 and encircles the pocket 17. The sleeve 21 forms the end wall of the pocket 17. Axially spaced sealing rings 22 and 23 seal the sleeve 21 with respect to the body 11 at locations above and below the pocket 17. A threaded retainer 24 mounted on the body 11 extends through an aperture 25 in the wall of the sleeve 21 to prevent relative motion of the sleeve with respect to the body.

A ball 26 rests on the inclined surface 27 defining the lower part of the pocket 17 and also extends into the small recess 28 formed within the inner surface of the sleeve 21. The ball is proportioned to seat within the insert 15 of the annular seat 14 to prevent upward flow of well fluid. The diameter of the ball 26 is larger than the diameter of the offset axial passage 18, and the inclination of the surface 27 is such that the ball cannot come to rest at the upper end of the passage 18.

The upper end of the body extension 13 comprises a plurality of individual spring fingers 30 each having an outward projecting latch lug 31. The lugs 31 are moved outward by the spring fingers to engage within an annular recess 32 provided in the tubing part 33.

A serrated part 34 on each spring finger 30 above the location of its latching lug 31 is used in connection with setting and

retrieval tools, not shown, for lowering the device into the well tubing and for retrieving it therefrom when desired.

In operation, the device 10 is lowered into the tubing string on a setting tool, not shown, and upon release of the setting tool the latching lugs 31 move outward into the recess 32. This anchors the device at the desired elevation in the tubing string in the well. The ball 26 remains in the inoperative position shown in FIG. 1, at the lower end of the pocket 17 and in contact with the sleeve 21. In this position of the ball, the flow passage 18 is unobstructed. Well fluid flows upward through the flow passage 18 and through the chamber 16 and annular seat 14 and through the passage 19 into the upper portion of the device and upward through the tubing. However, should the velocity of the flow of well fluid exceed a predetermined maximum, the ball 26 is drawn into the moving stream of well fluid and is moved into the chamber 16 and against the non-metallic insert 15 of the annular seat 14, thereby closing off flow of well fluid. Differential pressure across the ball 26 continues to hold it in contact with the seat. The well may be closed in at the surface by conventional means, not shown, to equalize the pressure across the ball 26 and thus permit it to move by gravity downward away from the annular seat 14 and into the offset pocket 17 to permit unrestricted flow through the passage 18.

Having fully described a preferred embodiment of my invention, it is to be understood that I am not to be limited to the details herein set forth, and that various modifications may occur to persons skilled in the art.

I claim:

1. In a device for controlling upward flow of fluid in a well, the combination of: a tubular body having a centrally positioned downward facing annular seat therein, the body having a central chamber below the seat and an inclined pocket on one side thereof communicating with the chamber, a sleeve encircling a portion of the body and forming an end wall of the inclined pocket, axially spaced sealing means between the body and the sleeve above and below said pocket, the body having an offset axial passage on the other side thereof remote from the end wall and communicating with the chamber, and a ball movable from an inoperative position in the pocket through the chamber to an operative sealing position in contact with said seat, to control flow through the body.

2. The combination set forth in claim 1 wherein the offset axial passage is smaller in diameter than the ball.

3. The combination set forth in claim 1 wherein the proportions of the inclined pocket and the offset axial passage are such in relation to said ball that the offset axial passage is substantially unobstructed when the ball is in its inoperative position in contact with said sleeve.

4. The combination set forth in claim 1 wherein the outer surface of the sleeve is substantially flush with the outer surface of the body.

5. The combination set forth in claim 1 wherein the sleeve is telescopically mounted on the body to permit insertion of the ball into the pocket before installation of the sleeve.

6. The combination set forth in claim 1 wherein the sleeve is provided with an internal recess to receive a portion of the ball and wherein removable retainer means is provided to prevent relative movement of the sleeve and the body.

7. The combination set forth in claim 1 wherein means are provided on the body for securing it in position within a well tube.

8. The combination set forth in claim 1 wherein spring fingers are provided on the body, and wherein a latching lug is provided on each spring finger for engagement with an element of a well tube.