



STATE COMMITTEE
FOR INVENTIONS AND
DISCOVERIES

(12) DESCRIPTION OF INVENTION ABSTRACT OF INVENTORS CERTIFICATE

(21) Application number: **4839881**

(22) Application filing date: **1990.06.18**

(45) Date: **1992.03.30**

(56) List of prior art documents: **USSR Inventor's Certificate № 1490255, cl. E 21 B 33/14, 1989. USSR Inventor's Certificate № 891892, cl. E 21 B 33/14, 1981. USSR Inventor's Certificate № 1148976, cl. E 21 B 33/14, 1982.**

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(54) Design for the reverse cementing of casing pipes

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Sample of Russian to English translation

(57) Abstract

The present invention relates to the construction of oil and gas wells. The design makes it possible to realize the direct flushing of wells. The essence of the present invention is that the design contains an inverted poppet-type valve in a hollow case. Above the valve is provided an upper perforated disk that can interact with a rod of the inverted valve. Below the inverted disk valve is provided a lower perforated disk that is rigidly connected to the inverted disk valve gate. Prior to cementing, a special polymer composition is pumped into the casing pipe. Under its action on the upper perforated disk, the inverted disk valve opens. The polymer composition is pumped into the annular space for a second time before the cement. Under its action on the lower disk, the inverted disk valve closes.

1 drawing. 1 claim.

The present invention relates to the construction of oil and gas wells, particularly to rigging for casing pipes during their cementing by the reverse method.

A design for the reverse cementing of casing pipes is known that contains a drill valve chamber with neutral buoyancy and with a throttle opening, a "Stop" ring and a bypass plug with a breakaway partition, a puller, a filter and a latch.

A design is also known for the reverse cementing of casing pipes that includes a case with an opening, in which a shoe-type nipple is installed on shear elements, which contains a service valve with a

cut-off valve made from a material with a density equal to that of the drill fluid and less than that of the cement slurry, and an inverted disk valve with a spring that possesses an opening thereabove.

The closest to the opening is a design for the reverse cementing of casing pipes comprising a hollow case in which is installed an inverted disk valve that has a seat and a gate on a spring-loaded rod.

Примечание [MFS1]: This seems strange; I would expect something like, "the closest to the offered invention..." <editor>.

The disadvantage of the known design is its complex construction and the fact that it does not provide conditions for direct flushing of the borehole.

The object of the present invention is the simplification of the design and the expansion of its technological possibilities by providing conditions for direct flushing of the borehole.

The indicated object is achieved through a design for the reverse cementing of a casing pipe that contains a hollow case that includes an inverted disk valve with a seat and a gate on a spring-loaded rod, and is equipped with upper and lower perforated disks and a bushing that is provided above the seat of the inverted disk valve and is rigidly connected to the case; the bushing possesses a ring groove on its internal surface; the upper perforated disk is fixed to the bushing on the shear elements and is provided with a spring lock on the bushing ring groove that can interact with the rod; a lower perforated disk is provided on the gate and is rigidly connected thereto.

The drawing shows a schematic view of the design for the reverse cementing of casing pipes.

The design for the reverse cementing of casing pipes includes case 1, inside of which is provided an inverted disk valve; the inverted disk valve includes seat 2 and gate 3 fixed on rod 4 rigidly mounted in case 1 above the inverted disk valve seat, bushing 5 with limiting collar 6 and ring groove 7 on its surface. Rod 4 of the inverted valve is equipped with spring 8. Perforated disk 9 with openings 10 is provided at the upper part of the rod 4 in bushing 5, and has limited movement along the rod 4; on rod 4 are provided limiters 11 and 12 to the travel of disk 9 that restrict the movement of disk 9; disk 9 is fixed in the upper part of the central opening of bushing 5 by shear elements 13 as well as spring-loaded locks 14, which interact with ring groove 7 on the seating of disk 9 on limiting collar 6. Perforated disk 15 with openings 16 is rigidly fixed on the lower end of rod 4 under gate 3.

The design functions in the following manner.

In the casing pipe, a certain volume of an elastic polymer composition (hereafter [referred to as] the polymer composition), which has a calculated value for the yield point, is pumped in during the well flushing prior to cementing. The polymer composition, which moves with the velocity of the flushing liquid and cuts off shear elements 13 when it reaches perforated disk 9 and draws down perforated disk 9 in such a way that it pushes limiter 12 of the travel, compresses spring 8, and draws down gate 3 and perforated disk 15. With the seating of disk 9 on limiting collar 6, spring-loaded lock 14 enters ring groove 7 to fix gate 3 in the open position, which then makes it possible to realize the reverse cementing of the casing pipe. The polymer composition is washed out onto the surface after flushing.

During the reverse cementing, a certain volume of the polymer composition is pumped into the annular space prior to the pumping of the cement slurry, and moves ahead of the cement slurry as a separator; when it reaches perforated disk 15, it cuts off spring-loaded locks 14, after which spring 8 acts

on gate 3 to shift into seat 2 and close the inverted valve. In this case, an additional sealing of gate 3 will take place due to the polymer composition pressing on disk 15.

During well flushing before cementing and during the cement slurry pumping, the flushing liquid circulates through perforated disks 9 (or 15) without substantial resistance to the flow, since the total area of openings 10 (or 16) in disk 9 (or 15) is marginally less than the cross-sectional area of the internal feedthrough of the casing pipe.

The cutting-off of limiters 12 (or spring-loaded locks 14) is accomplished due to the fact that when the polymer composition reaches perforated disk 9 (or 15), it pushes thereupon with a force that is proportional to the pressure in the casing pipe (or in the annular space), the calculated value of the yield point of the polymer composition, and the area of openings 10 (or 16).

Upon a further increase in the pressure in the casing pipe, the force of the pressure will increase; the polymer composition will break down and squeeze through openings 10 and 16 of perforated disks 9 and 15.

The cross-section of shear elements 13 and spring-loaded locks 14, the number and size of openings 10 and 16 in perforated disks 9 and 15, the rate of circulation and the polymer composition with a certain value for the yield point are selected on the basis of the conditions for when the forces for cutting off shear elements 13 (or spring-loaded locks 14) are less than the forces for the breakdown of the polymer composition.

A composition based on acrylic polymers, for example hydrolyzed polyacrylonitrile, is used as the polymer composition.

Claim

A design for the reverse cementing of casing pipes, comprising a hollow case in which is provided an inverted valve with a seat and a lock on a spring-loaded rod, wherein in order to simplify the design and to expand its technological possibilities by providing conditions for direct flushing, upper and lower perforated disks and a bushing are provided therein, where the bushing is provided above the inverted valve seat and the bushing is rigidly connected to the case and is provided with a ring groove on its internal surface, the upper perforated disk is fixed onto the bushing on shear elements and is provided with a spring lock that is designed to meet the bushing ring groove and can interact with the rod, and the lower perforated disk is under the gate and is rigidly connected thereto.