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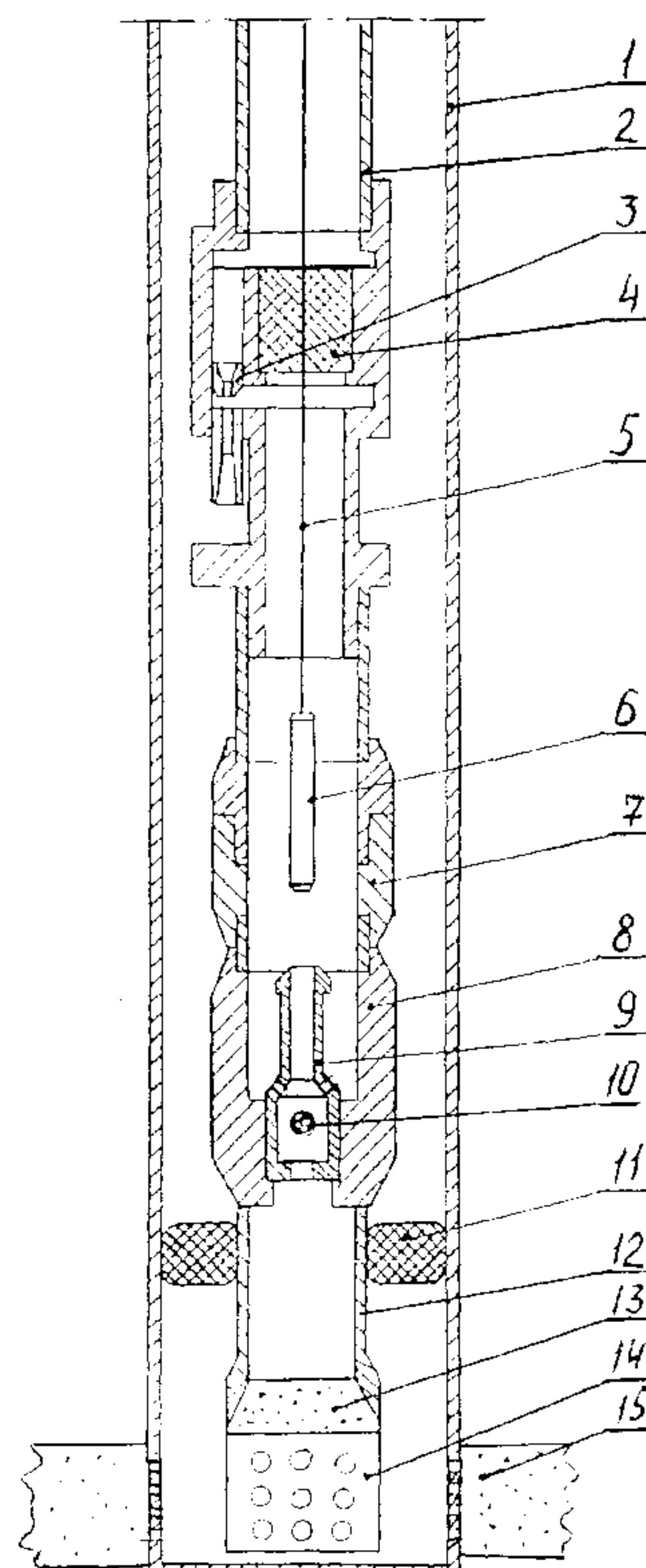
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(54) Titre : PROCEDE D'UTILISATION D'UNE UNITE DE POMPAGE POUR PUIITS DESTINEE A L'EXPLORATION DES
PUIITS ET DISPOSITIF DE MISE EN OEUVRE CORRESPONDANT

(54) Title: OPERATION MODE OF AN OIL WELL PUMPING UNIT FOR WELL DEVELOPMENT AND DEVICE FOR
PERFORMING SAID OPERATION MODE



(57) **Abrégé/Abstract:**

The invention relates to pumps, in particular to oilwell pumping units for crude-oil production. The inventive oilwell pumping unit comprises a wall packer mounted on a pipe string, a back valve, a jet pump fitted with an active nosepiece, a mixing chamber, a diffusing cell and a central channel in order to supply a passive medium, and a seal assembly. Said unit is also provided with a filter and a perforator. The operation mode consists in mounting the jet pump on the pipe string and the perforator thereunder, arranging the wall packer in the annular space of the pipe string, supplying an ejecting liquid medium through the pipe string to



(57) Abrégé(suite)/Abstract(continued):

the nosepiece of the jet pump, removing the liquid medium from the area beneath the packer with the aid of the jet pump and in draining the bench by blasting the perforator. The invention makes it possible to intensify an action on a well bore zone by optimizing different influencing factors for wells having an anomalously low formation pressure.

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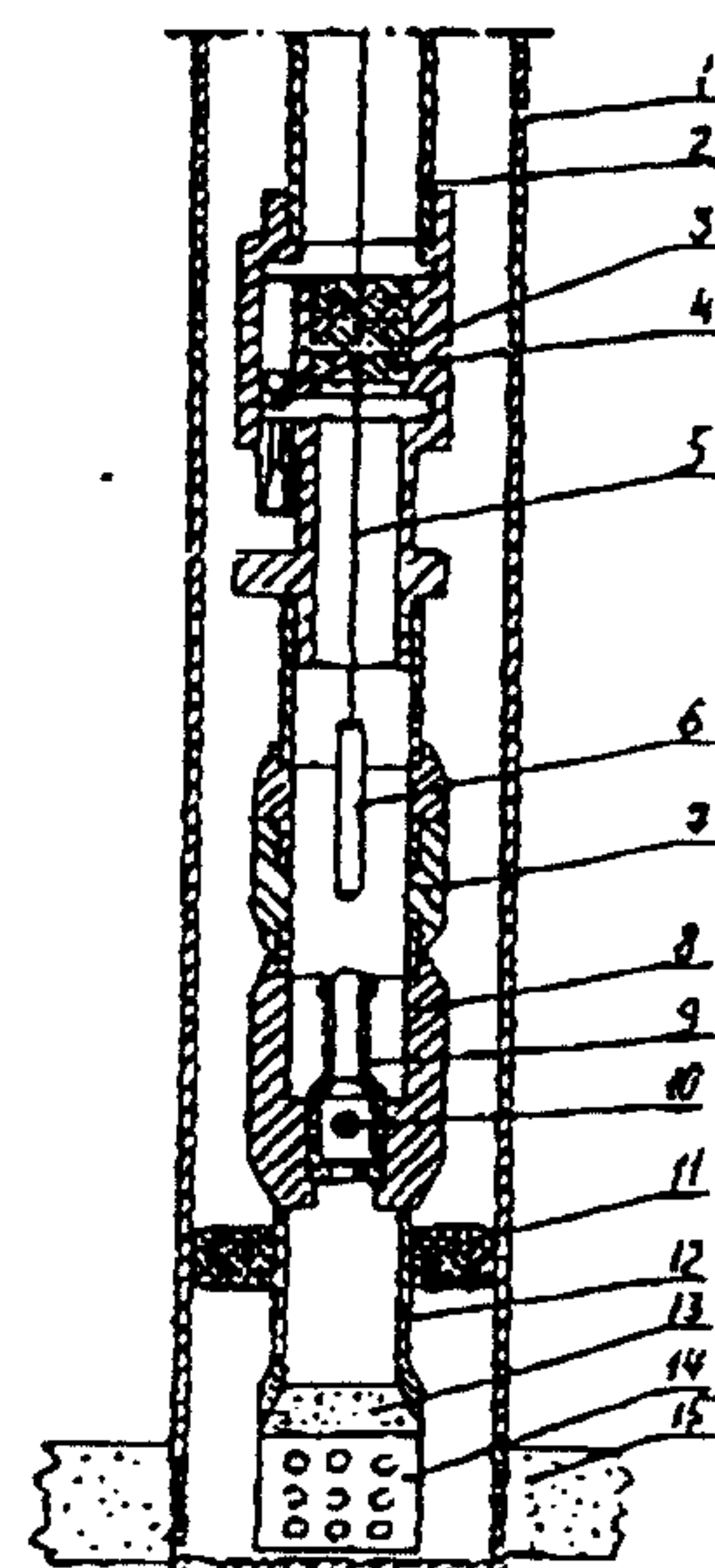
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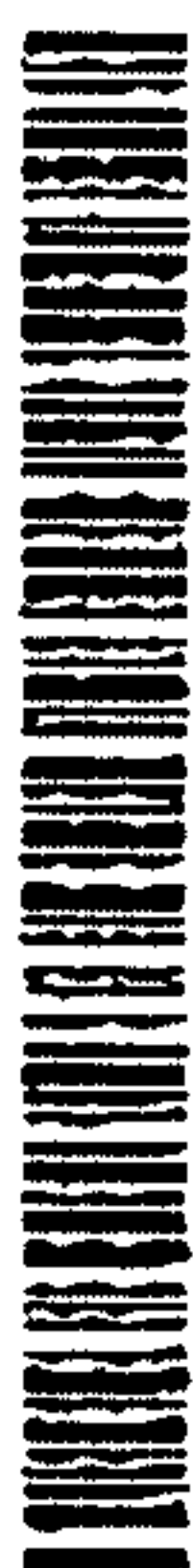
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СКВАЖИН И УСТРОЙСТВО ДЛЯ ЕГО ОСУЩЕСТВЛЕНИЯ(57) Abstract: The invention relates to pumps, in
particular to oilwell pumping units for crude-oil
production. The inventive oilwell pumping unit comprises
a wall packer mounted on a pipe string, a back valve, a jet
pump fitted with an active nosepiece, a mixing chamber, a
diffusing cell and a central channel in order to supply a
passive medium, and a seal assembly. Said unit is also
provided with a filter and a perforator. The operation mode
consists in mounting the jet pump on the pipe string and
the perforator thereunder, arranging the wall packer in the
annular space of the pipe string, supplying an ejecting
liquid medium through the pipe string to the nosepiece of
the jet pump, removing the liquid medium from the area
beneath the packer with the aid of the jet pump and in
draining the bench by blasting the perforator. The
invention makes it possible to intensify an action on a well
bore zone by optimizing different influencing factors for
wells having an anomalously low formation pressure.

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WO 01/92727 A1

OPERATION MODE OF AN OIL WELL PUMPING UNIT FOR WELL DEVELOPMENT AND DEVICE FOR PERFORMING SAID OPERATION MODE

Field of Invention

This invention relates to the field of pumping units, and, in particular, to pumping units for extraction oil from oil wells.

Prior Art

Known in the art is a method of operating a well pumping unit, comprising the installation of a jet pump onto the production string in the well, the placement of a geophysical instrument below the said jet pump in the production string, and pumping of the extracted fluid out of the well, while conducting fluid treatment in the well with the use of the said geophysical instrument (RU 2143597 C1).

The said method enables to pump different fluids, e.g., oil, out of wells, while simultaneously studying the effective formation and the extracted fluid.

However, the said known method does not enable to perform works for intensifying oil (hydrocarbons) production in wells through employing the more advanced secondary opening-up of productive formations, which narrows the field of its application.

Also known in the art is an oil well jet pumping unit, comprising a jet pump installed on the production string in the well and a geophysical instrument placed in the production string below the said jet pump (RU 2059891 C1).

The said jet pumping unit enables to pump different extracted fluids out of the well with the simultaneous treatment of the extracted fluid and the well formation zone.

However, the said known unit does not enable to prevent the formation from being repeatedly damaged by the working medium just after stopping the operation of the pumping unit, which narrows the field of its application.

The closest, as to its technical essence and the achievable result, to this invention is a method of operating an oil well pumping unit, comprising the installation of a jet pump onto the production string and the installation of a perforator below the said jet pump, the installation of a packer into the production string annular space, the supply an ejecting medium through the production string to the nozzle of the said jet pump, the pumping of the fluid out of the zone below the said packer with the said jet pump and the formation drainage through firing the said perforator (SU 1146416 C1).

The said method of operating the well pumping unit enables to perform works on intensifying the fluid extraction out of the well through firing (shooting) the perforator with the subsequent pumping the fluid out of the well with a jet pump.

However, the said known work method does not enable to optimize the works on intensifying the process of extracting different fluids out of wells, which results in an incomplete utilization of the well potential.

The closest, as to its technical essence and the achievable result, to this invention is an oil well jet pumping unit, comprising, all of them being installed on the piping string, a packer; a back pressure valve; a jet pump having an active nozzle, a mixing chamber, a diffuser and a central channel for supplying a passive medium; and a seal assembly (a gate), the said back pressure valve being installed below the said seal assembly and a geophysical instrument being installed on a well-logging cable going through the said seal assembly (RU 2121610 C1).

The said unit enables to perform work on intensifying the fluid extraction out of wells by influencing the formation with the said geophysical instrument and the subsequent pumping the fluid out of the well with a jet pump.

However, the said known unit does not enable to optimize the works on intensifying the process of extracting different fluids out of wells and perform works on effectively punching the formation under the well zone where the pumping equipment is installed, which results in an incomplete utilization of the well potential.

Description of Invention

The objective of this invention is to intensify the action on the well formation zone due to optimizing various influence factors in subpressure wells, and, owing to it, to stimulate the fluid production during the well development after drilling or during a well-workover operation.

The objective in respect of method can be solved through employing a work method of an oil well pumping unit, where the said method comprises the installation of a jet pump onto the production string and the installation of a perforator below the said jet pump; the installation of a packer in the production string annular space, the supply of an ejecting medium through the production string to the nozzle of the said jet pump, the pumping of the fluid from the well area under the said packer and the formation drainage performed by firing the said perforator; and, in employing the method according to this invention, a geophysical instrument is installed below a jet pump after the installation of the latter in the production string, a back pressure valve and a filter are installed below the said geophysical instrument; after that an ejecting medium is supplied to the nozzle of the said jet pump, the pressure drawdown is measured with the use of the said geophysical instrument, and after reaching a preset stable pressure drawdown a signal to shoot the said perforator is sent from the said geophysical instrument, the formation fluid being continuously pumped out by the said jet pump through the said filter and the said back pressure valve; and, after a stable flow of the fluid extracted from the well is established, the supply of the said ejecting medium to the jet pump is stopped, the said geophysical instrument is removed, the said jet pump is disconnected from the said valve and is raised to the surface; after that a production pump is installed above the said back pressure valve on the production string, and the said production pump is used for pumping the extracted fluid out of the well.

The objective in respect of device can be solved through the use of a oil well jet pumping unit, comprising, all of them being installed on the piping string, a packer, a back pressure valve, a jet pump having an active nozzle, a mixing chamber, a diffuser and a central channel for supplying a passive medium, a seal assembly (a gate), the said back pressure valve being installed below the said seal assembly and a geophysical instrument being installed on a well-logging cable going through the said seal assembly, and the said oil well jet pumping unit according to this invention further comprises a filter and a perforator, the said geophysical instrument being installed above the said back pressure valve and below the said jet pump, and the said filter and the said perforator being installed below the said back pressure valve, the said piping string is made with a connecting/disconnecting insert located above the said back pressure valve, the said geophysical instrument is equipped with a physical (e.g., acoustic, electromagnetic, etc.) field source for initiating firing of the said perforator, the said perforator being equipped with a receiver of such physical fields.

The analysis of pumping various fluids, primarily oil, out of wells shows that the optimization of the pumping unit operation mode, when combined with the use of a perforator, enables to create well conditions for producing the maximum possible flow rate of the fluid extracted from a formation. Of significant importance in such conditions is the possibility of performing, with the use of a well jet pumping unit, operations for creating the necessary differential pressure drawdown and shooting the perforator (i.e., performing shooting and firing works in wells, which are associated with the firing of jet perforator charges in the conditions of the optimal differential pressure drawdown).

The possibility of shooting the perforator after reaching a stable and necessary pressure drawdown enables to achieve the maximum effect of the perforator firing energy, which results in an improvement of the secondary opening-up quality and in removal of the mud particles impeding the inflow of the extracted fluid from the formation to the well. As a result, after the perforator firing the formation immediately begins kicking, and an intensive process of the formation perforation and pore clearing occurs around the wellbore. In high-yield oil- and, especially, gas-producing wells it results in an intensive pressure increase at the wellhead, as the well is filled with the formation fluid.

The jet pump operation after the firing of the perforator enables to remove the mud particles out of the well, thus preventing a reduction in the inflow from the formation to the well.

The installation of a back pressure valve enables to avoid an ejecting medium's entering into the perforations at all stages of well development, in particular at the stage of substituting another pumping means, e.g., a production pump, for the jet pumping unit. The monitoring of the well parameters in the process of the formation drainage enables to correctly determine the pump type necessary for the further well operation with maximum efficiency.

Thus, the objective of the invention - to optimize development works on subpressure wells for the purpose of extracting various fluids out of wells and, owing to it, to intensify the production of various fluids - is achieved.

Brief Description of Drawings

Fig. 1 shows a oil well pumping unit implementing the proposed method, at the time of the formation drainage works.

Fig. 2 shows the same unit at the time after the removal of the jet pump and the geophysical instrument out of the well.

Fig. 3 shows the same unit at the time after the substitution of a pump for extracting the produced fluid out of the well for the jet pump.

Preferred Embodiment

The oil well pumping unit, as used for the implementation of the proposed method, comprises the production string 2 installed in the well casing 1, the jet pump 3 and the seal assembly (gate) 4 installed in the case, the well-logging cable 5 with the geophysical instrument 6 attached thereto. The production string 2 is equipped with the connecting/disconnecting insert 7; the valve assembly 8, which comprises the valve insert 9 with the back pressure valve 10, is installed below the insert 7. In the annular space of the production string 2 the packer 11 is installed, and the liner 13 with the filter 13 and the perforator 14 is installed below the packer 11 on the

production string 2. The perforator 14 is placed in the area of the formation 15. The production pump 16, which is intended for pumping the extracted fluid out of the well during the well producing life, may be installed with the use of the connecting/disconnecting insert 7 above the insert 7 and over the valve 10 on the production string 2.

The described method of operating the oil well pumping unit can be implemented as follows.

In the well on the production string 2 the jet pump 3 is installed, below which the connecting/disconnecting insert 7, the back pressure valve 10 placed in the valve insert 9, the filter 13 and the perforator 14 are installed. When installing the jet pump 3, the geophysical instrument 6 is installed in the production string 2 below the jet pump 3. After that the installation (releasing) of the packer 11 is carried out in the annular space of the production string 2, which enables to separate the well space. After that the ejecting medium is supplied through the production string 2 to the nozzle of the jet pump 3, which enables to start pumping with the jet pump 3 out of the well zone under the packer. The parameters in the well zone under the packer are monitored with the use of the geophysical instrument 6, and after reaching a stable differential pressure drawdown the signal to shoot (to fire jet charges) the perforator 14 is sent from the geophysical instrument 6. In the result of firing the perforator 14 the secondary opening-up and drainage of the formation is performed. The jet pump 3 continues to pump the formation fluid through the filter 13 and the back pressure valve 10, and the monitoring of the pressure drawdown, the flow rate and the composition of the formation fluid is conducted with the use of the geophysical instrument 6. After a stable inflow of the fluid extracted from the well, e.g., oil, is established, the supply of the ejecting medium to the jet pump 3 is stopped, which results in the hydrostatic pressure buildup between the jet pump 3 and the back pressure valve 10. At this time the valve 10 closes, preventing the working fluid from entering into the area under the packer and, correspondingly, into the formation, thus excluding contamination of the latter. The geophysical instrument 6 is raised to the surface out of the production string 2 with the use of the well-logging cable 5. After that the jet pump 3 is disconnected from the valve assembly 8 and the lower part of the unit with the use of the connecting/disconnecting insert 7 and is raised to the surface together with the production string 2. Then the production pump 16 is installed above the back pressure valve 10 on the production string 2 in the well and is used for

pumping of the extracted fluid out of the well. In the result the well is put into the production mode.

Industrial Applicability

The present invention may be used in the oil industry and in the mining industry when extracting various fluids from wells. The proposed invention, as compared to the prototype and the other known technical solutions, has a number of significant advantages, namely: the action on the well formation zone is intensified owing to the optimization of various influencing factors in subpressure wells, thus stimulating the extraction of various fluids from wells being developed or under workover operation.

CLAIMS

1. The method of operating an oil well pumping unit, comprising the installation of a jet pump and a perforator below the said jet pump on the production string, the installation of a packer in the annular space of the said production string, the supply an ejecting liquid medium through the production string to the nozzle of the said jet pump, the pumping of the fluid out of the well area under the said packer, and the formation drainage performed by firing the said perforator, characterized in that a geophysical instrument is installed below a jet pump after the installation of the latter in the production string, a back pressure valve and a filter are installed below the said geophysical instrument; after that an ejecting medium is supplied to the nozzle of the said jet pump, the pressure drawdown is measured with the use of the said geophysical instrument, and after reaching a preset stable pressure drawdown a signal to shoot the said perforator is sent from the said geophysical instrument, the formation fluid being continuously pumped out by the said jet pump through the said filter and the said back pressure valve; and, after a stable flow of the fluid extracted from the well is established, the supply of the said ejecting medium to the jet pump is stopped, the said geophysical instrument is removed from the production string, the said jet pump is disconnected from the said valve and is raised to the surface out of the well; after that a production pump is installed above the said back pressure valve on the production string, and the said production pump is used for pumping the extracted fluid out of the well.

2. An oil well jet pumping unit comprising, all of them being installed on the piping string, a packer, a back pressure valve, a jet pump having an active nozzle, a mixing chamber, a diffuser and a central channel for supplying a passive medium, a seal assembly, the said back pressure valve being installed below the said seal assembly and a geophysical instrument being installed on a well-logging cable going through the said seal assembly, characterized in that the said oil well jet pumping unit comprises a filter and a perforator, the said geophysical instrument being installed above the said back pressure valve and below the said jet pump, and the said filter and the said perforator being installed below the said back pressure valve, the said piping string is made with a connecting/disconnecting insert located above the said back pressure valve, the said

geophysical instrument is equipped with a physical field source for initiating firing of the said perforator, and the said perforator is equipped with a receiver of such physical fields.

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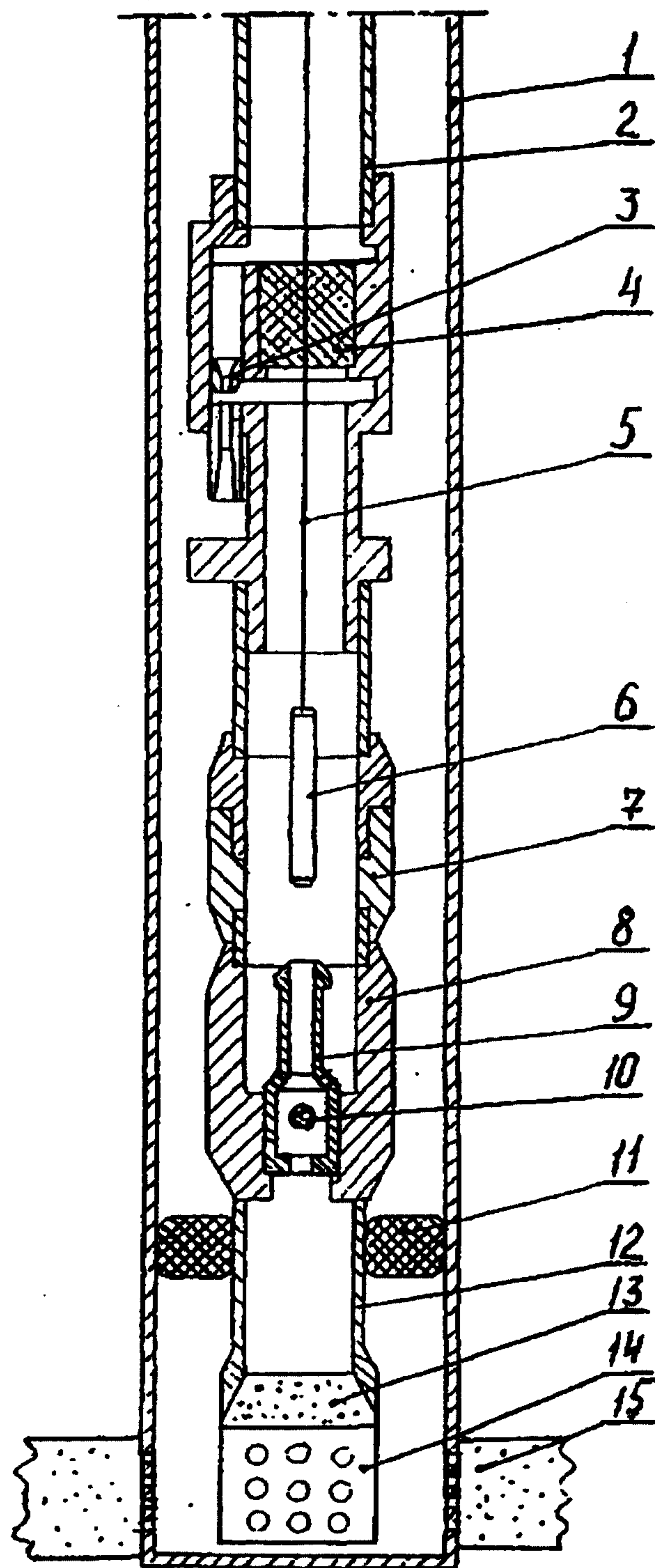


FIG. 1

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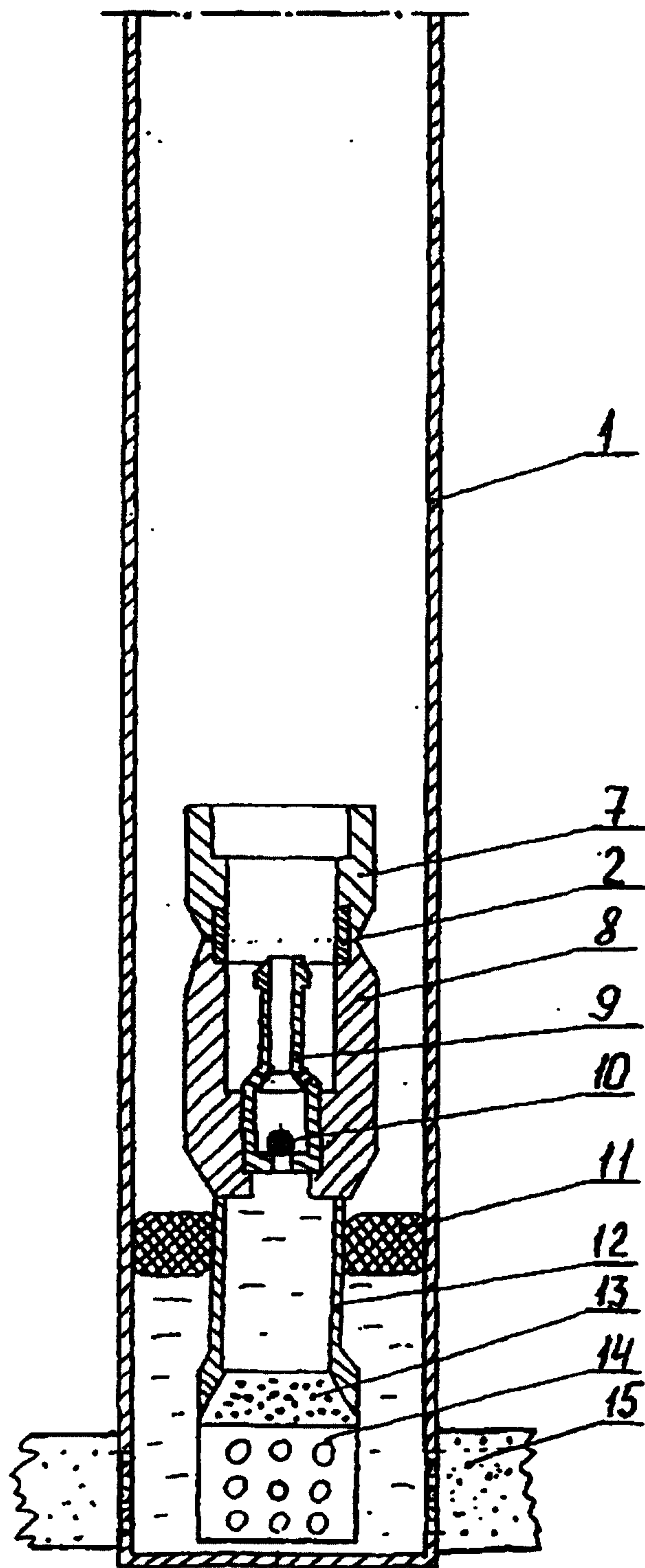


FIG 2

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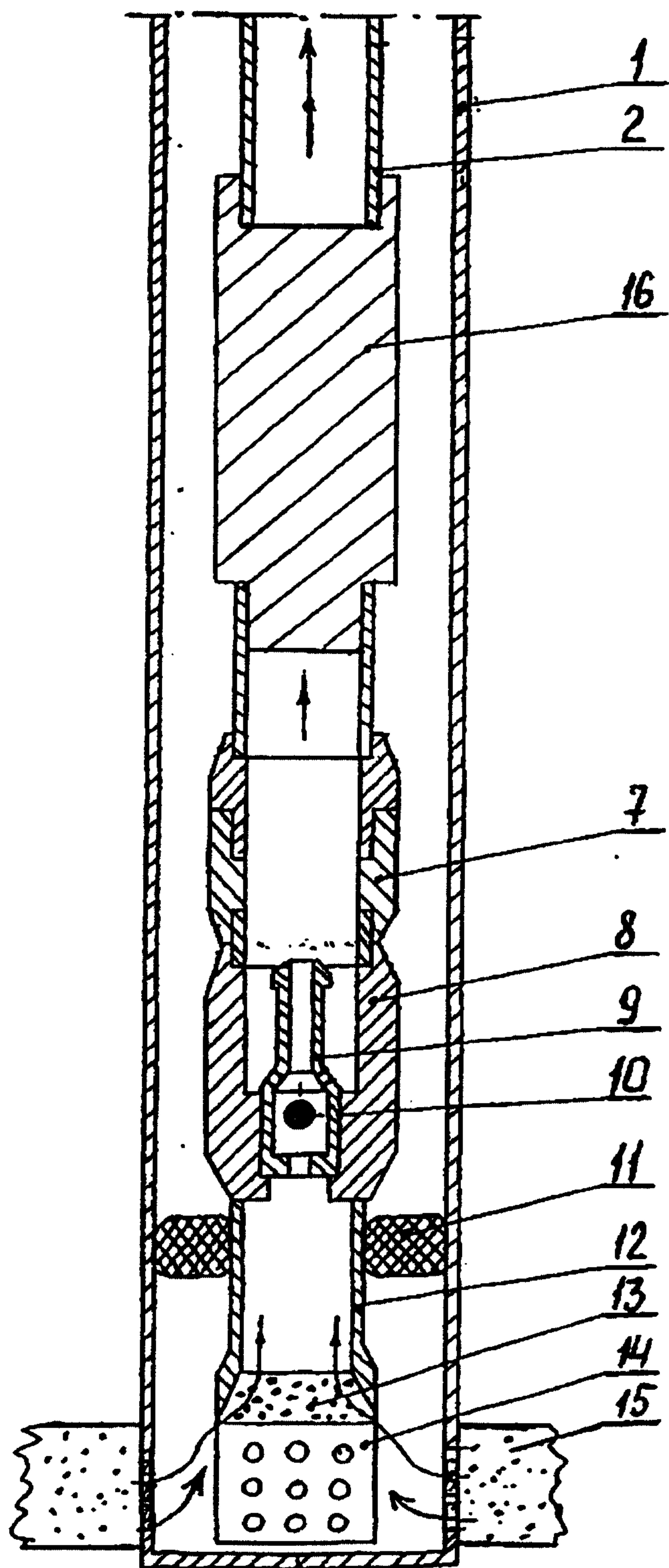


FIG 3

