Jan. 16, 1968 L. T. ERCK 3,363,572

PRESSURE PUMPING DEVICE

Filed Sept. 1, 1965

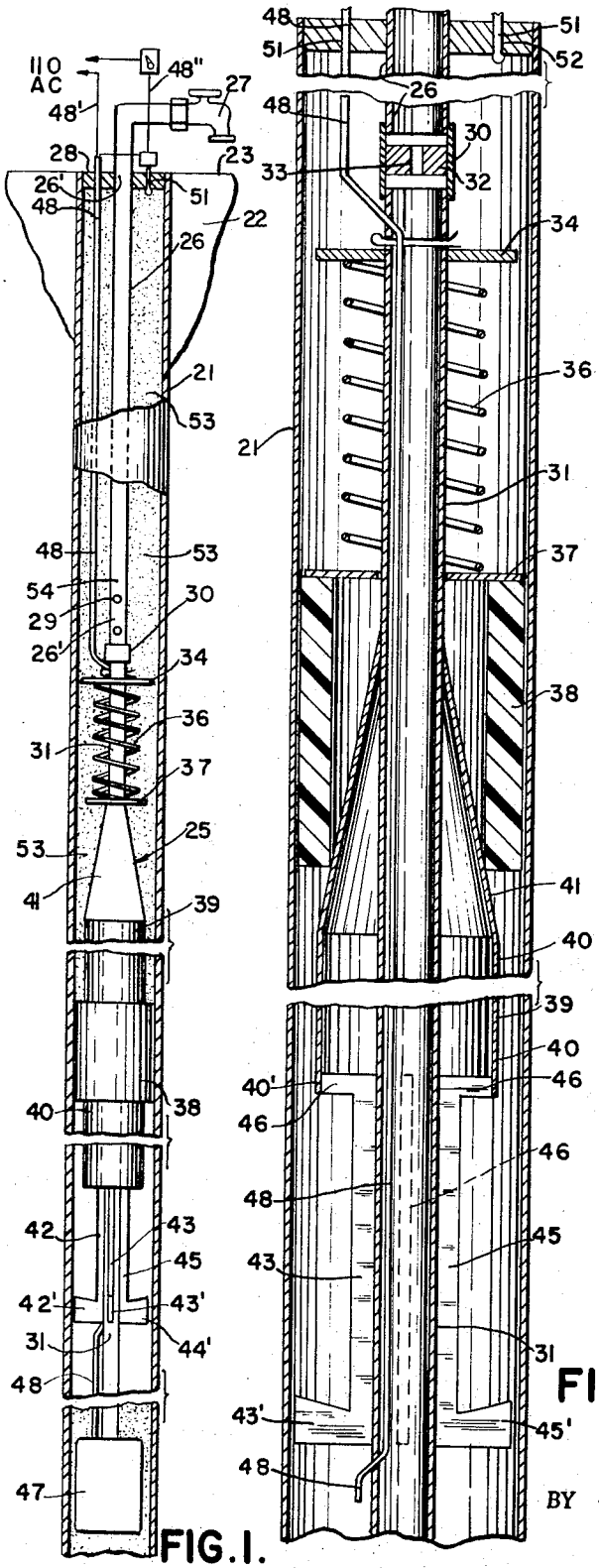


FIG. 1.

FIG. 2.

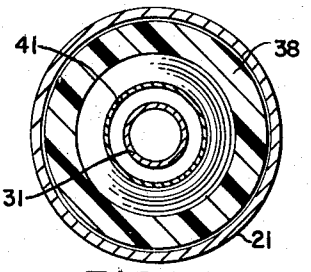


FIG. 4.

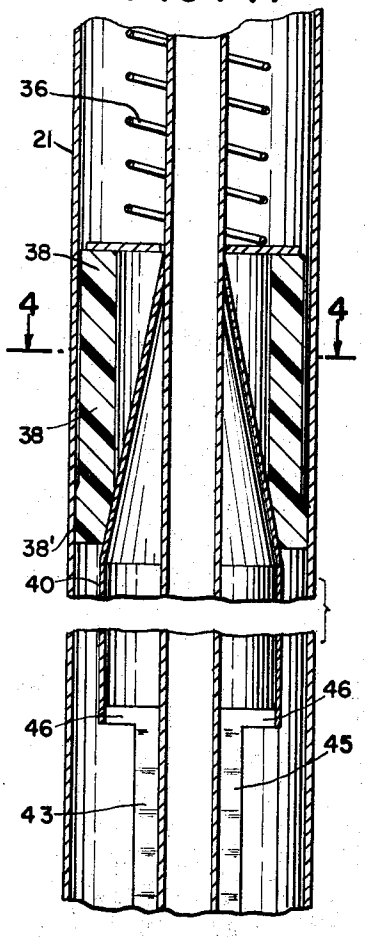


FIG. 3.

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3,363,572

Patented Jan. 16, 1968

3,363,572

PRESSURE PUMPING DEVICE

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Filed Sept. 1, 1965, Ser. No. 484,235
4 Claims. (Cl. 103—25)

ABSTRACT OF THE DISCLOSURE

This invention is a pressure pumping device comprising a pipe adapted to extend downward into a well, a rubber collar slidably mounted on said pipe intermediate the ends of the pipe, collar expansion means on said pipe beneath the collar and spring means above said collar urging said collar onto the expansion means and against the well tubing, an air tight seal for said well tubing spaced above said collar and a pump mounted to said pipe beneath said expansion means, whereby said device may be placed in a well in position and then raised to urge said collar firmly on said expansion means and create a second air tight seal and water may be pumped up said pipe past the collar into the space between the first air tight seal and the collar under pressure with a one way valve in the pipe to retain the water space therebetween, with pressure sensitive means in said space regulating the activation of said pump and thereby regulating the pressure.

This invention relates to well equipment, more particularly the invention relates to a well pressure pumping device and to the method of installing said device in operative relation in a well.

It is an object of the invention to provide a novel pressure pumping mechanism which may be rapidly and easily installed in a well for pumping fluid from the well under pressure.

It is a further object of the invention to provide a novel simplified pressure pumping mechanism for a well which may be manufactured with a minimum of cost and where the pumping and pressure producing mechanism may be disposed entirely within the well tubing.

It is a further object of the invention to provide a novel pumping device which may be adapted to various types of wells, and which may be rapidly installed as well as rapidly removed from the well.

Further objects and advantages of the invention will become apparent as the description proceeds and when taken in conjunction with the accompanying drawings wherein:

FIGURE 1 is an elevational view of the pressure pumping invention, shown in operative position in a well.

FIGURE 2 is an enlarged elevational view of the pressure pumping invention, illustrating the pressure sealing mechanism as it is being introduced into the well.

FIGURE 3 is a side elevational view of the pressure pumping invention, illustrating the pressure sealing mechanism, as the torpedo expansion unit is being introduced upward into the rubber collar seal.

FIGURE 4 is a cross-sectional view taken along line 4—4 of FIGURE 1.

Briefly stated, the invention comprises a pressure pumping device having a spring biased rubber collar, adapted to be telescoped over a torpedo structure on a pipe to create a seal in the well a substantial distance below the surface, with a pump at the lower end of the pipe to pump water from the bath of the well through the torpedo portion and rubber seal to the well portion thereabove, a seal at the top of the well creating a pressure tank in the well between the rubber collar and seal member whereby water may be pumped above the rubber

seal to create sufficient water pressure to force the water to flow out a water outlet at the top of the well. The torpedo unit has a plurality of fins at its lower end to remove the rubber seal, when removing the pressure pumping device from the well for repair or replacement.

Referring more particularly to the drawing, in FIGURE 1, a conventional well tubing 21 is shown extending downward into the ground from the surface 23 to a source of well water 24 at the bottom of the well.

The pressure pumping device 25 is shown operatively installed in the well, being disposed along and within the well tubing 21. The pressure pumping device has a water pipe 26 which extends downward from a faucet 27 at the surface of the well. The pipe 26 extends centrally through an annular disc seal member 28, in water tight relation. The pipe 26 has a plurality of holes 29 at intervals along its length, as to its portion within the well tubing 21. A metal sleeve 30 at the lower end of pipe 26, connects pipe 26 to pipe 31. A ring member 32 is fitted within the sleeve 30 and fixed thereto. The ring member has a central bore 33 the size of which regulates the flow of water upward from pipe section 31 to pipe 26. The ring member 32 will be field fitted, with a size bore 33 desired, depending upon the characteristics of the particular well, so that the desired rate of flow of water can be obtained, compatable with the rate of flow of the particular well.

Immediately below the sleeve 30 is an annular metal disc 34 which is fitted over the pipe 31. A colter key 35 passes through a pair of bores on opposite sides of pipe 31 to secure the disc 34 from upward movement. Underneath the disc 34 is a coil spring 36 which surrounds the pipe 31. Beneath the coil spring is a second annular plate 37 which is slidably mounted to the pipe 31, and beneath the annular plate 37 is an annular cylindrical rubber collar or sleeve 38, which is spring urged downward by the spring 36 when the rubber collar and other structure of the invention are in their positions illustrated in FIGURE 2.

Beneath the rubber collar 38 is a metal torpedo-like body member 39, which surrounds the pipe 31 and is fixed thereto. The torpedo member 39 has an elongated cylindrical shell portion 40, and a conical nose portion 41 fixed at the upper end of the portion 40.

Four identical fin plates 42, 43, 44, and 45 are fixed to the pipe 31, at 90° intervals about the pipe 31. The upper laterally projecting ends 46 of the fins are fixed within the lower end 40' of the cylindrical shell 40. The fins each have projecting flanges 42', 43', 44', and 45' at their lower ends which act to catch the lower edge of the rubber collar 38, when removing the invention from the well, to remove the collar 38 along with the rest of the mechanism.

At the lower end of the pipe 31 is a conventional submersible electric pump 47, having an electric motor sealed therein to power the pump. An electric cord 48 extends up from the motor of the pump 47 into a bore 49, at the lower end of the pipe 31. The cord 48 is sealed in watertight relation in the bore 49. The cord 48 extends upward through the pipe 31, past the torpedo fins, body 39, cover 41, and rubber collar 38, coil spring 36, and disc 34 and out of the pipe 31, through a bore 50 in the pipe 31, first above the disc 34. The cord 48 is also sealed in watertight relation in the bore 50. The cord 48 extends upward along side of pipe 26 and through a bore 51 in the sealing disc 28. The cord 48 is also sealed in watertight relation in the bore 51 of the disc 28. One line 48' of the cord passes through a conventional pressure sensitive switch 52, which acts to open and close the line, and then line 48' passes through a master switch which also acts to open and close line 48. Then both

lines 48' and 48'' are connected to a conventional power source.

The pressure sensitive switch 51 is mounted in the bore 52 of the disc member 28, and responds to the changes in the pressure in the reservoir area 53. The reservoir area extends from sealing disc 28 to the rubber collar 38. The pressure sensitive switch 51 acts to start the pump motor of the pump 47, when the pressure in the reservoir area 53 drops below a certain level, and acts to turn off the motor of the pump when the pressure exceeds a certain level.

Installing the pressure pump invention

The pressure pump device 25 is installed into the water well by inserting the pressure pump device 25 down the well tubing 21, with the rubber collar 38 being urged downward by the spring 36 into the position generally illustrated in FIGURE 3. Since the discs 34 and 37, the coil spring 36, torpedo 39, the fins, the pump 47 and cord 48 are all attached to the pipe 31, and the pipe 26 is attached to pipe 31, the device 25 may be lowered into the well by lowering the pipe 26.

As the device 25 travels down the well tubing, the rubber collar will be urged upward in a direction away from the torpedo 39 and upward away from its position illustrated in FIGURE 3 by the reaction of the rubber collar 38 in contacting the inner walls of the well tubing 21.

Thus, in moving the device downward, the torpedo body member 39 will not expand the rubber collar 38 sufficiently to prevent the collar and torpedo and the rest of the device 25 from sliding downward with relative freedom.

The device will be lowered into the well until the pump 47 is submerged in the water to be pumped from the bottom of the well. The pump will be submerged a distance substantially greater than the length of the cylindrical shell 40. The device 25 will then be raised and the friction of the lower edge 38' of the rubber collar against the inside of the well tubing 21 will restrain the rubber collar from moving upward in the well tubing 21, as the device 25, including the torpedo 39 is raised upward, thereby causing the cover of the torpedo to move upward entirely through the collar 38. The device 25 will continue to be raised, with the rubber collar 38 remaining relatively stationary in the tubing 21 until the rubber collar 38 is approximately midway of the length of the shell 40. The expansion of the rubber collar 38 by the shell portion 40 effectively creates a watertight seal at the location of the collar 38, so that water can only pass therethrough in the pipe 31.

When the collar has been placed midway of the length of the torpedo, the pump 47 will still remain substantially below the level of the water 24 to be pumped from the bottom of the well, and the device is now in operative position as generally illustrated in FIGURE 1. The pipe 26 will now be secured to the seal member, and the seal member attached to the top of the well tubing 21, in watertight relation to the tubing 21 with the device 25 in its position illustrated in FIGURE 1.

It is contemplated that the rubber collar 38 may have a vertical height of 5'', and the shell portion 40 may have a height of 24'', in a well tubing having a 4'' inside diameter, for example.

Operation of pressure pump device

The operation of the pressure pump device is substantially as follows:

The pump 47 is powered by an electric motor, the motor receives its electrical power through the cord 48. The conventional pressure sensitive switch 52 acts to open and close the line 48' of the cord 48 to thereby start and stop the pump motor and pump.

The pump 47 pumps water up through pipe 31 into pipe 26 and out through the holes 29 in the pipe 26, to fill the reservoir area 53. The pump will continue to fill the reservoir area with water, until the pressure reaches, for example, 60 pounds per square inch, at which time pressure sensitive switch will be set to automatically react to open the line 28' and turn off the motor. A pressure between 40–60 pounds per square inch will normally be sufficient to cause water to flow out the pipe 26 through the faucet 27, when its valve is open. When sufficient water has been allowed to flow through the faucet 27 to cause the water pressure in the reservoir area to drop, for example, 40 pounds per square inch, the switch will set to automatically react to close the line 28' and thereby start the motor and cause more water to be pumped into the reservoir area again until the pressure again reaches 60 pounds per square inch. Thus, the process will continue to repeat itself, thereby keeping the pressure between 40–60 pounds per square inch in the reservoir 53 so that the system will have a continuous force flow of water out the faucet 27.

Removal of the pressure pump device

The pressure pump device may be removed by detaching the seal member 28, from the upper end of the well tubing 21, and thereafter drawing the pipe 26 upward thereby raising the entire device upward, except the rubber collar 38, which will be restrained in its position by the shell portion 40. The shell 40 will slide upward, however, until the shell slips out of the collar 38 thereby allowing the rubber collar 38 to retract about the straight portions 43'', 44'', 45'', and 46'' of the fins, with the lower projecting flanges 43', 44', 45', and 46' engaging the lower edge of the rubber collar to raise the rubber collar upward and out of the well along with the rest of the device.

The invention also acts to develop the well. The pump creates a vacuum near the source of water at the bottom of the well, and the vacuum effect tends to increase the flow of the well.

The pump 47 also has a conventional one way valve or check valve which allows water to move or be pumped up the pipe 31 from the pump, but prevents water from flowing back down the pipe 31.

A second one way valve may be placed in pipe 31 immediately beneath the fins, as a further precaution, so that water will flow only up the pipe 31.

As a modification, the pipe 26 may be cut off immediately below the seal 28, and immediately above the opening 29, at numeral 54, and replaced by a conventional link chain which chain would be used to connect the upper end 26' of the pipe 26 to the lower end 26'' of the pipe 26, thereby eliminating nearly all of the pipe 26, except the relatively short upper and lower ends.

As a further modification, when using the device for deep wells, say 400–600 feet, and when using the pressure tank feature, the pipe 26, would be cut off immediately above the opening 29 at numeral 54, and the upper portion of the pipe 26 above numeral 54 would still extend down say a depth of say 40 feet to provide in effect a 40 foot pressure tank, and one end of the chain would be attached to the pipe 26, immediately above the cut off 54 and the chain would extend down nearly all of the 400–600 feet, the other end of the chain would be attached to pipe 26, immediately below the cut off 54, and above the holes 29. Thus, in deep wells, a drop pipe or pipe 26 can be eliminated for nearly all of the depth of the well.

Thus, it will be seen from the foregoing that a novel simplified well pressure pumping device has been provided, which may be rapidly installed and removed from a well.

It will be obvious that various changes and departures may be made to the invention without departing from the spirit and scope thereof and accordingly it is not intended that the invention be limited to that specifically described

in the specification or illustrated in the drawing, but only as set forth in the appended claims herein:

What is claimed is:

1. A pressure pumping device comprising a pipe means adapted to extend downward into well tubing of a well, a resilient collar on said pipe means, expansion means on said pipe means for expanding said collar to create a first air tight seal in said well tubing, biasing means urging said collar onto said expansion means to create said second airtight seal when said pipe means has been placed in operative range in said well tubing for pressure pumping, a second airtight seal, a second seal in said well tubing and spaced above said first air tight seal in said tubing, said pipe having an opening between said first and second seal, a pump attached to the lower end of said pipe means and adapted to pump fluid up said pipe and out said opening to create a reservoir of water in said well tubing between said seals under pressure, a one way valve on said pipe means to retain fluid in said reservoir, a pressure sensitive device to regulate said pressure, a valve communicating with said pipe above said seals to release fluid from said reservoir under pressure, means urging said collar means off of said expansion means for contracting said collar for slidably removing said pipe means from said well tubing.

2. A pressure pumping device comprising pipe means adapted to extend downward into well tubing of a well, a resilient collar slidably mounted on said pipe means, expansion means on said pipe means for expanding said collar to create a first air tight seal in said well tubing, biasing means on said pipe means urging said collar onto said expansion means, said collar frictionally coacting with said well tubing to be retained at least partially contracted and above said expansion means while lowering said pipe means into operative range in said well tubing, and frictionally coacting with said well tubing to frictionally work its way onto said expansion means and expand by raising said pipe means when in its operative range, and frictionally coacting with said well tubing to slide off said expansion means and contract when further raising said device to remove said device from said well tubing, hangers on said pipe below said expansion means to catch said contracted collar after sliding off said expansion means, a second seal for said well spaced above said rubber collar and creating a second air tight seal in said well tubing, said pipe means having an opening between said first and second seal, a pump at the bottom of said well adapted to pump fluid up said pipe and out said opening to create a reservoir of water in said well tubing between said seals under pressure, a pressure sensitive device to regulate said pressure, a valve having a conduit communicating with said reservoir between said seals to release fluid from said reservoir under pressure.

3. A pressure pumping device comprising pipe means adapted to extend downward into well tubing of a well, a resilient collar slidably mounted in said pipe means, expansion means on said pipe means for expanding said collar to create a first airtight seal in said well tubing,

biasing means on said pipe means urging said collar onto said expansion means, said collar being disposed away from said expansion means while lowering said pipe means onto operative range in said well tubing and frictionally coacting with said well tubing to frictionally work its way onto said expansion means by movement of said collar relative to said expansion means when in operative range, and frictionally coacting with said well tubing to slide off of said expansion means and contract when raising said device to remove said device from said well tubing, hangers on said pipe below said expansion means to catch said contracted collar after sliding off of said expansion means, a second seal for spaced above said resilient collar and creating a second airtight seal in said well tubing, said pipe means having an opening between said first and second seal, a pump attached to the lower end of pipe means adapted to pump fluid up said pipe means and out said opening to create a reservoir of water in said well tubing between said seals under pressure, a pressure sensitive device to regulate said pressure, a valve having a conduit communicating with said reservoir between said seals to release fluid from said reservoir under pressure.

4. A pumping device comprising pipe means adapted to extend downwardly into well tubing of a well, and a resilient collar slidably mounted on said pipe means, expansion means on said pipe means for expanding said collar to create an airtight seal in said well tubing, spring biasing means on said pipe means urging said collar onto said expansion means, said collar being disposed away from said expension means while lowering said pipe means onto operative range in said well tubing and frictionally coacting with said well tubing to frictionally work its way onto said expansion means by movement of said collar relative to said expansion means when in operative range, and frictionally coacting with said well tubing to slide off of said expansion means and contract when raising said device to remove said device from said well tubing, hangers on said pipe below said expansion means to catch said contracted collar after sliding off of said expansion means, said pipe means having an opening above said seal, a pump attached to the lower end of said pipe means adapted to pump fluid up said pipe means and out said opening.

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