United States Patent [19]

Penwell

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[54] **METAL LINED METAL PUMP BARREL**

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Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 41,367, May 28, 1970, Pat. No. 3,678,811.

[52] **U.S. Cl.**.....**92/169,** 29/156.4

[51] **Int. Cl.**.....**F01b 11/02**

[58] **Field of Search**..138/109, 140, 141, 143, 145 D, 138/167; 308/4 R; 285/423, 169, 170, 171, 55, 286, 334.5; 29/156.4

[56] **References Cited**

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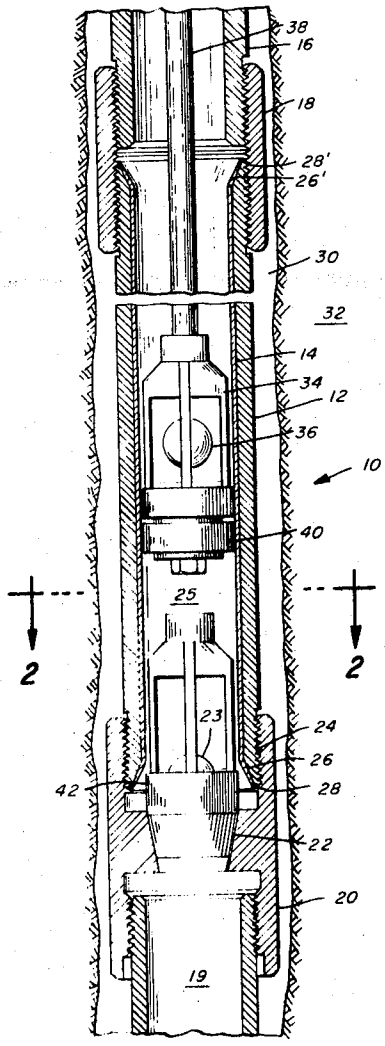
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Assistant Examiner—R. H. Lazarus
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[57] **ABSTRACT**

This invention describes a working barrel for a deep well pumping unit. The working barrel comprises an outer steel pipe which is lined with a thin tubing of selected non-corrosive material. The inner corners of each end of the pipe is beveled. The lining is pressed outwardly against the inner surface of the pipe, and the liner and the pipe are welded together along the periphery of the outer edge of each end, to make a seal so that there will be no fluid leakage between the liner and the pipe.

1 Claim, 3 Drawing Figures



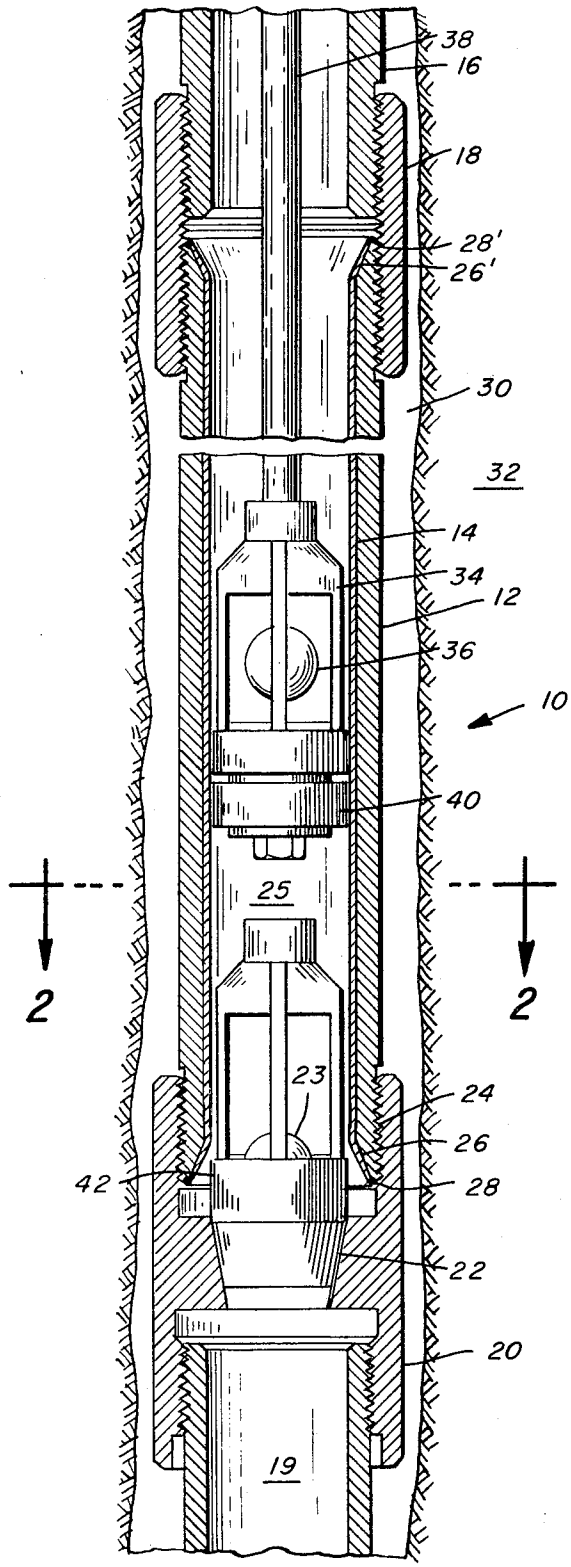


FIG. 1

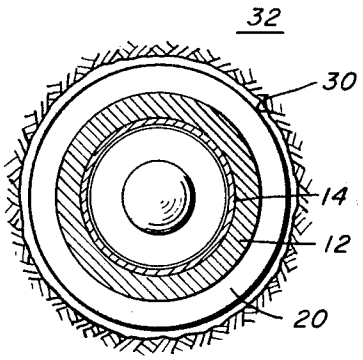


FIG. 2

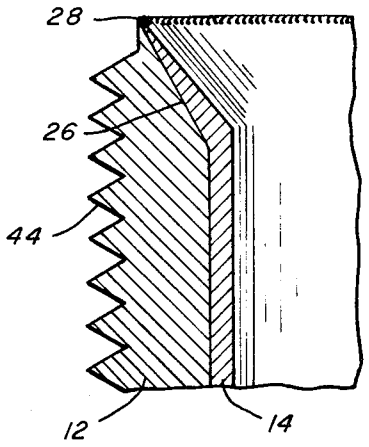


FIG. 3

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METAL LINED METAL PUMP BARREL

CROSS-REFERENCE TO RELATED APPLICATION

This invention is a continuation-in-part of a copending application Ser. No. 41,367, filed May 28, 1970, entitled "Oil Well Pump Working Barrel" now U.S. Pat. No. 3,678,811, dated July 25, 1972.

BACKGROUND OF THE INVENTION

This invention is in the field of oil well pumping devices. More particularly, it is related to the working barrels of a sucker rod type pump.

Present day working barrels of deep well pumps, such as used for pumping oil from an underground reservoir, commonly comprise a long rigid cylindrical metal pipe which is carefully bored and honed to form a cylinder, or working barrel, into which is fitted a reciprocating piston. In order to prevent corrosion and pitting of this barrel, it is made of a noncorrosive material, such as stainless steel, plated brass, monel metal, etc. Because such materials are more expensive than steel, the pump barrels are generally quite costly and means have been sought to make them less expensive. The prior art shows instances where a thin liner has been applied to the inside of a steel working barrel. However, these, in general, have been unsatisfactory because of the imperfect fitting and leakage of fluid behind the liner, causing corrosion of the unprotected metal pipe comprising the working barrel.

It is an object of this invention to provide a working barrel constructed of relatively inexpensive metal and to provide a liner on the inside to fully protect the barrel from corrosion due to the fluid passing through the pump.

SUMMARY OF THE INVENTION

These weaknesses of the prior art devices and the objectives of this invention are met by a working barrel which comprises a long cylindrical pipe formed of relatively inexpensive metal, such as steel, with a thin-walled tubular liner pressed inside of the pipe. The inner corners of the pipe are beveled to a relatively sharp edge at the outer surface. The liner is formed in close contact with this beveled portion, and the liner and the edge of the barrel are welded together at the outer corners.

These and other objects of this invention and a better understanding of the principles and details of the invention will be evident from the following description taken in conjunction with the appended drawings, in which:

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 shows in elevation a cross-section of a working barrel and pump.

FIG. 2 is a cross-section of the working barrel taken along the line 2—2 of FIG. 1.

FIG. 3 is a detail in section of the end of the working barrel showing the manner in which the pipe and the liner are formed and welded together.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to the drawings, which show in FIG. 1, a borehole **30** in the earth **32**. This borehole extends

from the surface down to a great depth, where it engages the porous rock of an oil reservoir, so that oil can be pumped from the bottom of the borehole to the surface. To do this, a string of tubing **16** extends downward from the surface attached together by couplings **18**. At the lower end of the tubing string is a pump, generally indicated by the numeral **10**. This comprises a working barrel **12**, which is a long straight pipe with the internal surface carefully bored to be a true smooth cylinder, and finally honed to provide a smooth surface so that the pump piston **34**, with rubber seals **40**, which is attached to a string of sucker rods **38**, can reciprocate up and down inside the smooth internal cylindrical surface of the working barrel.

A standing valve **22** is fastened into the system at the lower end of the pump. This comprises a seat portion **42**, with a sealing ball **23** which sits on the circular seat. The sucker rod pump piston **34** is provided with rubber cup sealing means **40** and a valve seat with a seal ball **36**. The rubber cups **40** are adapted to snugly seal against the smooth internal surface of the pump cylinder, or barrel, so that as the sucker rod **38** is lifted, the piston **34** rises, the ball **36** seals the seat in the lower end of the pump piston and any oil above the piston is lifted upward toward the surface.

As the pump moves upward, a suction below the piston draws oil from the reservoir **19** up through the standing valve **22** and fills the space **25** between the standing valve and the piston. After the piston has finished its up-stroke and starts down, the oil in the space **25** is sealed off and prevented by dropping by the seal ball **23**, so that as the piston moves down the oil now passes through the seat in the bottom of the piston, lifting the seal ball **36** as it does so, and as the piston passes down through the oil, the oil is now standing on top of the piston ready for the next up-stroke of the piston, which lifts it up the tubing **16**. By this process oil is pumped out of the reservoir **19** in the bottom of the borehole **30**.

It will be readily seen that the pump barrel or cylinder **12** is a fairly expensive piece of equipment since it must be rigid. It must be bored as a true cylinder and must be smoothly finished or honed on the inside so as to protect the rubber seals **40** of the piston. Furthermore, because many of the fluids pumped from the well are of a corrosive nature, the pump barrel is generally made out of a noncorrosive material such as stainless steel, monel metal, etc., which are very expensive alloys. In order to avoid this large expense, this invention covers the use of a conventional steel pipe **12**, with a non-corrosive metal liner **14**.

The pipe is first beveled on the inside corners as shown at **26** and **26'**. Next, the liner **14** which may be of noncorrosive material, such as stainless steel, monel, etc., is placed on the inside of the pipe and is press fitted outwardly against the barrel itself. One way of doing this is to spin the tubing into the inside of the barrel by a rotating member which is slightly oversize and, by being turned inside the tubing exerts an excessive force outward, to cause the tubing to be tightly fitted to the inside of the barrel. Also, modern techniques of explosive forming may be used to expand the liner **14** into the inside of the pipe **12**. The liner can be of a selected thickness, which is generally in the range of one thirty-second to three thirty-seconds inch, and is preferably about one-sixteenth inch thick.

At each end, the liner is formed outwardly against the sloping edges of the beveled portions **26**, **26'** and the liner and the pipe itself are welded in a bead **28** at the outer edge of each end. This is shown in more detail in FIG. **3**.

The barrel now comprises a rigid pipe with a tight fitting liner of noncorrosive material, so that the internal finishing boring and honing can provide a smooth cylindrical pump barrel as is required. The liner covers the complete surface of the barrel so that there is no possibility of corrosion. The welding prevents leakage of well fluids between the liner and the barrel which would cause corrosion and ill fitting of the liner to the barrel.

While the pump barrel is shown with an external thread on each end adapted to be fitted into couplings **18** and **20**, it will be clear that a female thread or any other type of fastening can be used. The important detail being that the lining itself is welded to the pipe so as to provide a perfect seal of the space between the liner and the pipe.

As shown in FIG. **3** the outer surface of the pipe **12** is undercut below the root diameter of the threads **44** so as to provide clearance in the threads of the couplings for the weld bead **28**.

While the invention has been described with a certain degree of particularity, it is manifest that many changes may be made in the details of construction and the arrangement of components. It is understood that the invention is not to be limited to the specific embodiments set forth herein by way of exemplifying the invention, but the invention is to be limited only by the scope of the attached claim or claims, including the full range of equivalency to which each element or step thereof is entitled.

What is claimed:

1. In a subterranean oil well sucker rod type of pump for use in pumping well fluids from a deep borehole in the earth, including a string of tubing supporting a working barrel for said pump, and a string of sucker rods to reciprocate the pump piston in said working barrel, the improvement in said working barrel comprising:

a. a long tubular pipe of rigid metallic construction, the inside periphery adjacent each end beveled outwardly, said pipe including male threads at each outside end;

b. a thin-walled tubular liner of stainless steel extending within said pipe, along its entire length, the ends of said liner beveled outwardly against said beveled portions adjacent each end of said pipe, said liner forming the inner periphery of said barrel for said pump piston for at least the operative stroke of said pump;

c. the ends of said pipe and said liner united, as by welding, at each end of said barrel at a diameter intermediate the internal diameter of said liner and the root diameter of said threads, to form a tight seal between said pipe and said liner.

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