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W. E. PIELOP, JR

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SLUSH PUMP PISTON AND ROD ASSEMBLY

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2 SHEETS—SHEET 1

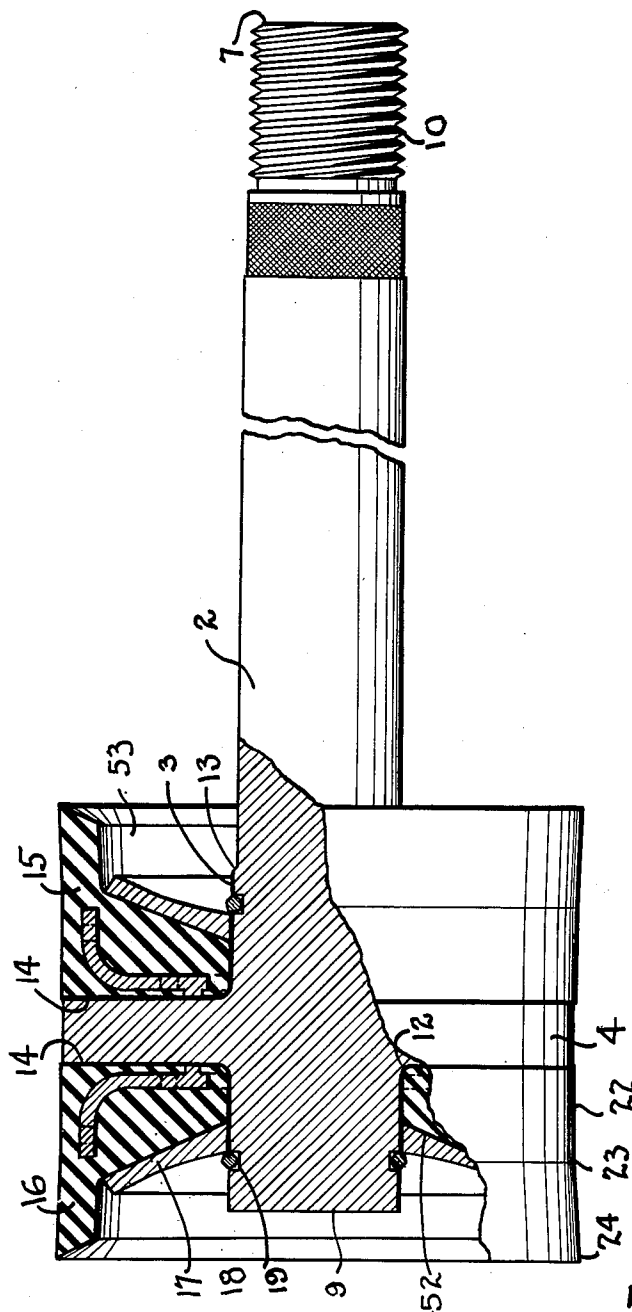


Fig. 1

Inventor

W. E. Pielop, Jr.

Lester B. Clark
Ray L. Smith
ATTORNEYS.

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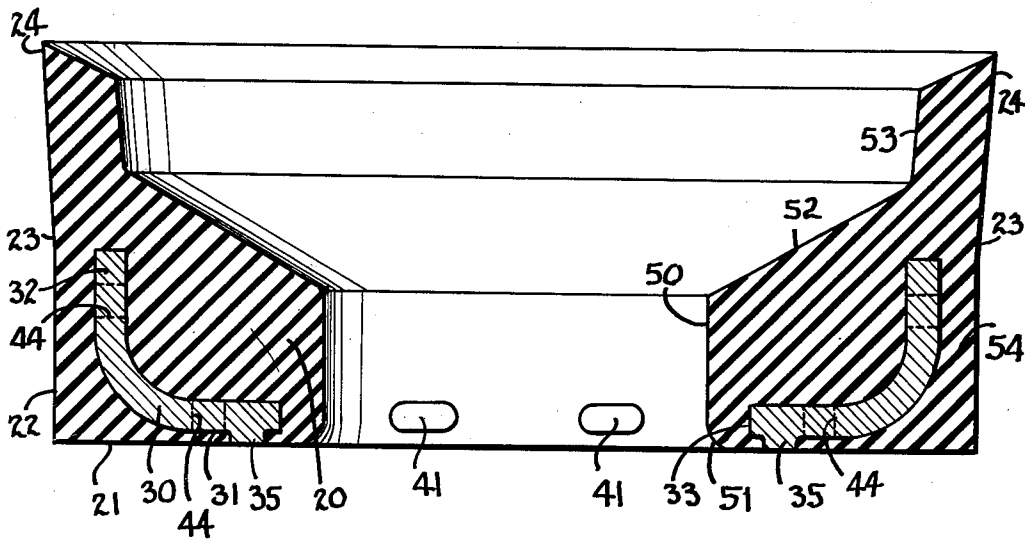


Fig. 2

Inventor

W. E. Pielop, Jr.

Lester B. Clark
Ray L. Smith,
ATTORNEYS.

UNITED STATES PATENT OFFICE

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SLUSH PUMP PISTON AND ROD ASSEMBLY

William E. Pielop, Jr., Houston, Tex.

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2 Claims. (Cl. 309—33)

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The invention relates to a slush pump rod, piston, body, flange, and sealing rings whereby the metal rod, body, and flange constitute a single forging to which the sealing rings may be affixed. In the pumping of drilling mud in the rotary method of drilling wells considerable difficulty is encountered in pumping the viscous abrasive mud wherein pressures of 2,000, 3,000 and 4,000 pounds per square inch may be maintained.

The pumping action is usually accomplished by means of reciprocating pistons moving in the pump cylinder. The piston is actuated by means of the pump rod which is connected to the power end of the pump and the resilient sealing ring of the pump piston maintaining a seal with the cylinder liner in applying pressure and suction during operations.

It has been the practice in the past to provide a pump rod as one element and a piston as a separate element to be affixed to the pump rod. Leakage between the piston and rod is a source of considerable difficulty because of the applied stresses and the shock of the reciprocating operation.

The present invention contemplates that the rod, piston body and the piston flange which supports the sealing rings may all be constructed as an integral forging to which the sealing rings may be readily applied and removed, and in this manner the principal source of leakage be eliminated.

It is one of the objects of the invention to provide an integral forging formed of a single billet of steel which is forged into the combination rod, body and flange with a single heat.

Another object of the invention is to provide a method of making a slush pump rod in which the metal grain structure is axially of the rod with a radial flange thereon in which the grain structure is radially of the flange.

Another object of the invention is to provide a sealing ring for slush pump pistons wherein a cupped sealing member is provided with a dish reinforcing which centers the ring on the rod and braces the ring against the piston flange.

A still further object of the invention is to provide removable sealing rings for an integral rod and piston where the reinforcing in the rings abuts both the flange and the rod so as to accurately lock the seal ring.

A still further object of the invention is to provide a particular type of reinforcing or slush pump seal ring wherein a flair sealing lip is unaffected by the reinforcing dish of the ring.

Other and further objects of the invention will

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be readily apparent when the following description is considered in connection with the accompanying drawings wherein:

Fig. 1 is a side elevation of the pump rod and piston assembly with certain parts shown in section to illustrate the arrangement thereof.

Fig. 2 is a transverse sectional view of one of the sealing rings illustrating the reinforcing and arrangement of the parts.

Fig. 1 shows the rod 2 which has been formed of a single billet of steel wherein the rod is slightly enlarged at 3 and has the radial flange 4 formed thereon so that the rod 2, the piston body 3, and the piston flange 4 are all one integral or unitary steel member.

In the past it has been found difficult, if not impossible, to form a slush pump rod and piston as a unitary device because of the forging difficulties.

The applicant has devised a method of forging the integral rod, body and flanging by the use of a high powered hydraulic forge. This forge has the dies arranged so that a heated billet of steel can be positioned in the forge and by the application of hydraulic pressure the billet is forced into a hollow cylinder die of the configuration of the rod in such a manner that the end 7 of the rod abuts the bottom of the die and stops any further forging movement of the rod portion 2. This single pass of the dies forces the billet into the female die in such a manner that the grain structure of the metal lies axially of the rod due to the drawing operation. When the end 7 of the forging abuts the bottom of the die then the upper die is shifted to provide a die capable of forming the flange and the end 9 of the piston body 3 so that the entire rod is formed with a single heat. The pressure of the forge causes the flange 4 to be formed radially of the body 3 and the grain structure thereof extends radially of such flange. Of course the forging is in the rough but it has been found that such forging is capable of being treated and machined to create the finished integral rod, body, and flange in which the metal stresses can be relieved so that the piston rod and body are capable of presenting long and satisfactory service. The end 7 is threaded at 10 so that the rod may be connected to the power end of the pump, not shown.

The flange 4 is machined to provide the ferrule 12 where the flange merges into the body 3. The body 3 as seen at the bevel 13 is slightly larger in diameter than the main position of the rod member 2.

The flange 4 extends radially from the rod

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and has the flat flange faces 14 which are arranged to receive the seal rings 15 and 16. These rings are identical but oppositely facing as seen in Fig. 1. These rings 15 and 16 will be slipped over the piston body 3 until they abut the faces of the flange. Retainer plate 17 is then slipped over the body and a locking ring 18 positioned in the annular groove 19 formed in the body so that the plate 17 is held firmly in position to retain the rings 15 or 16. It seems obvious that a simple and economical structure and procedure for positioning and retaining the sealing rings on the piston body has been devised.

One of the sealing rings is shown in section in Fig. 2 and may be described in detail as being comprised of a cup-shaped body 20. Each ring has a flat base 21 to abut the face 14 of the flange when the ring is in operating position.

Each of the rings has a cylindrical peripheral surface 22 which joins the base 21. This cylindrical surface 22 merges at 23 with the flared lip 24 and is so arranged that the inherent resiliency of the ring material maintains the lip flared into engagement with the pump cylinder, not shown.

When it is considered that these pistons are subjected to liquid pressures of several thousand pounds per square inch it is obvious that such sealing rings must be suitably reinforced to prevent the liquid from blowing by the ring. The inherent resiliency of the ring maintains the lip against the inside surface of the pump liner.

If the sealing ring should be subject to excessive flow or radial expansion the tremendous pressure of the pumped liquid would force the resilient material of the ring too firmly against the pump liner so as to cause the burning or destruction thereof. In order, therefore, to hold the body portion of the ring in proper position a reinforcing dish 30 has been provided. This dish is made up of an annular metal forging which has a flat bottom 31 and skirt 32. There is a central opening 33 in the bottom 31 which is somewhat larger than the piston body 3. There is a plurality of circumferentially spaced studs or projections 35 projecting below the bottom 31 sufficiently so as to abut the face 14 of the flange 4. In this manner the dish 30 will be accurately positioned against the flange and in turn maintain the resilient material of the ring in proper position.

In order to center the ring on the piston and piston body 3 a plurality of radially inwardly directed lugs 41 project from the bottom 31 of the dish through the resilient material so as to contact the piston and body.

Particular attention is directed to the fact that the bottom and the skirt 32 of this ring 30 extend outwardly of the sealing ring at least to the junction 23 between the cylindrical surface 22 and the bottom of the lip 24. In this manner the cylindrical surface 22 is reinforced and supported against radially outward distortion.

This feature is of advantage because with certain types of pistons now in use the tremendous end thrust against the liquid by the sealing cup causes considerable distortion of the resilient material of the piston and if the resilient material flows outwardly an excessive pressure may be created on the liner to such an extent that some of the resilient material of the ring is burned away due to the friction of the resilient material with the pump liner.

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With the present piston the rigid reinforcing dish has been found to avoid the damage and distortion of the sealing ring for long periods of time.

The resilient ring portion is formed with the central opening 50 which is beveled at 51 to fit the ferrule 12 between the flange and piston body. Outwardly, beyond the cylinder portion 50, the piston has a cupped, or beveled, surface or shelf 52 which merges into the annular surface 53 on the inside of the lip 24. Attention is directed to the fact that the lip 24 has substantial thickness so that the inherent resiliency thereof is sufficient to hold the lip against the liner surface.

The dish 30 has a plurality of openings 44 in the base and the skirt so as to allow the resilient material 54 of the piston to be molded in these openings so as to secure the reinforcing firmly in the piston. As seen in Fig. 1 the lip 24 extends outwardly beyond the retainer plate 17 and may be urged outwardly against the cylinder liner by the liquid being pumped on the working stroke of the piston.

It would appear that a simple and economical integral piston body and flange and pump rod have been devised wherein the sealing rings of the piston are readily removable.

In actual operation it has been found that the considerable cylindrical length 22 of the piston serves to provide a large bearing area with the liner so as to distribute the load of the piston and in this manner a minimum of wear occurs on the piston due to the pumping action or movement in the liner. It seems obvious that the piston sealing rings can be readily affixed and released from the piston and that no leakage is possible due to the fact that the piston body and flange constitute an integral forging with the pump rod.

Broadly, the invention contemplates an integral piston rod, body, and flange on the one hand, and a serviceable reinforced piston seal ring on the other hand wherein such rod and piston are utilized as a slush pump rod and piston assembly.

What is claimed is:

1. A seal ring for slush pump pistons comprising, a cup shaped resilient body, a flat base thereon to abut the face of a piston flange, an annular peripheral surface including a cylindrical portion adjoining said base, and a flared lip joining said cylindrical portion so that the inherent resiliency of the ring material maintains said lip flared in engagement with a pump cylinder, a reinforcing dish in said ring comprising a metal forging having a skirt to face outwardly in said ring and having a flat bottom, a central opening in said bottom which is somewhat larger than a piston body, a plurality of circumferentially spaced studs projecting below said bottom to engage the face of the piston flange so as to position the ring and transmit the thrust of the pumping action to said flange, a plurality of circumferentially spaced lugs projecting radially inward of the bottom and into the opening, said lugs being of a length to fit said piston body to center said ring, a plurality of circumferentially spaced ports in said bottom and skirt through which the ring material is molded, said skirt being cylindrical and disposed radially inward from the cylindrical surface of said ring to prevent deforming of the ring material in use so as to avoid excessive wear of the periphery of said ring, said skirt being of a length to extend at least to the junction of said lip with the cylin-

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dricl ring surface, said ring having a cupped outwardly facing interior to receive a retainer plate, said lip extending beyond said plate to provide a flexible ring end.

2. A seal ring for slush pump pistons comprising, a cup-shaped resilient body, a flat base thereon, a central opening in said body, an annular peripheral surface including a cylindrical portion adjoining said base, and a flared lip joining said cylindrical portion so that the inherent resiliency of the ring material maintains said lip flared, a reinforcing dish entirely within said ring comprising a metal forging having a skirt to face outwardly in said ring and having a flat bottom, a central opening in said bottom of larger diameter than said opening in said body, a plurality of circumferentially spaced studs projecting below said bottom, a plurality of circumferentially spaced holes in said flat base through which said studs extend, a plurality of circumferentially spaced ports in said bottom through which the ring material is molded, said skirt being cylindrical and disposed radially inward

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from the cylindrical surface of said ring to prevent deforming of the ring material in use so as to avoid excessive wear of the periphery of said ring, and said skirt being of a length to extend adjacent to the junction of said lip with said cylindrical portion.

WILLIAM E. PIELOP, JR.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
15 Re. 16,978	Joyce -----	May 29, 1928
1,849,096	Kibele -----	Mar. 15, 1932
1,936,598	Handler -----	Nov. 28, 1933
2,051,262	MacClatchie -----	Aug. 18, 1936
2,189,839	Sharp et al. -----	Feb. 13, 1940
20 2,244,954	Lenz et al. -----	June 10, 1941
2,341,803	Mott -----	Feb. 15, 1944
2,519,144	MacClatchie -----	Aug. 15, 1950