

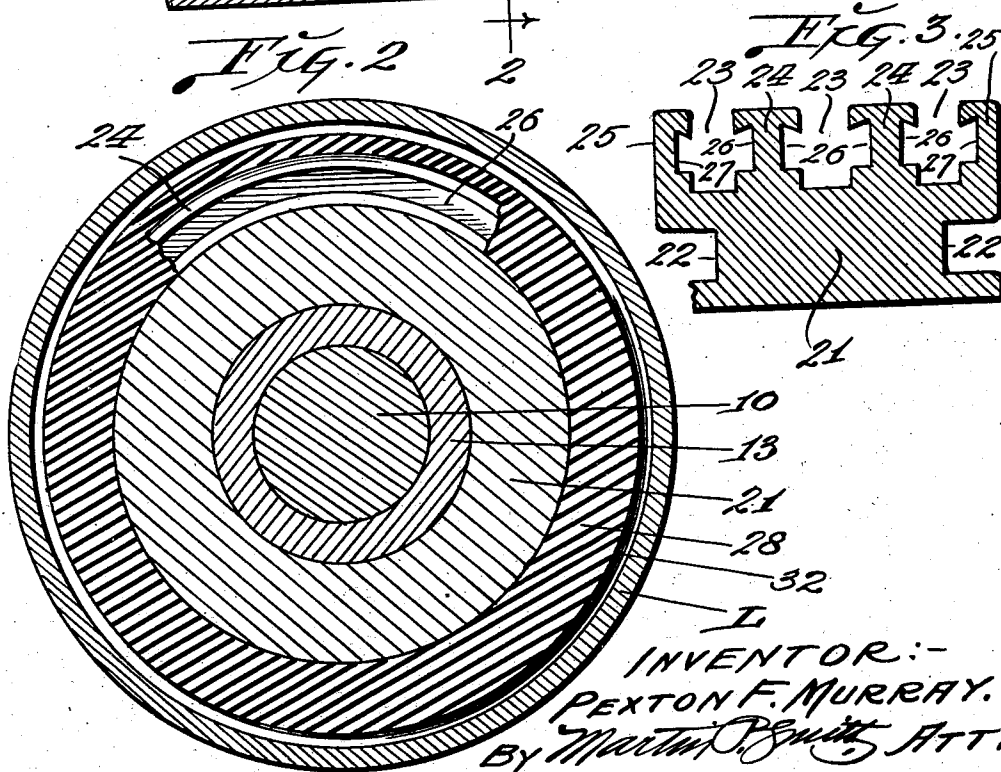
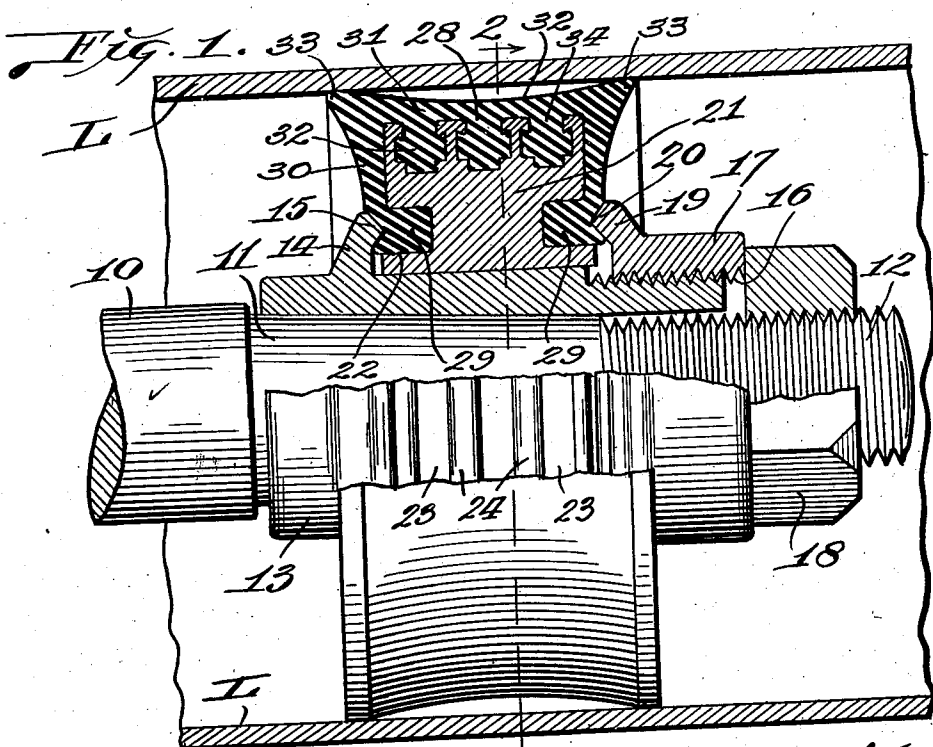
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SLUSH PUMP PISTON

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SLUSH PUMP PISTON

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My invention relates generally to pistons and more particularly to the pistons of the slush pumps that are utilized for effecting a circulation of fluid through deep wells for the purpose of bringing the cuttings from the drill to the surface, and the principal objects of my invention are, to generally improve upon and simplify the construction of the slush pump pistons now in general use and to provide a piston having a narrow double lip ring-type piston sleeve of rubber, or composition of which rubber is one of the ingredients, that is molded into specially designed grooves in a core, so as to very securely anchor the sleeve on said core and preventing the bulging of the rubber or composition of the sleeve in the concave area between its lips.

Further objects of my invention are, to provide a slush pump piston that is capable of being readily applied to or removed from the piston rod, the construction being such as to eliminate removal of the rod from the liner in order to replace the sleeve, further, to provide for a perfect fluid pressure tight joint or seal against washing between the sleeve and spool and further, to provide a piston having a sleeve carrying spool that will receive various sizes of sleeves when reducing the pump liners, thereby effecting a material saving of time, labor and consequent expense when repairing the pump in which the piston is used.

A further object of my invention is, to provide a slush pump piston that is constructed without exposed rims in the central portion of the periphery of the piston sleeve, which exposed rims tend to score the pump liners or to cause shearing of the rubber in the sleeve when pressure forces produce a bulging of the sleeve at the joints or seams between the rim and sleeve.

In former years slush pumps operated at a pressure not greater than three hundred fifty pounds due to the fact that the well holes were shallow and the operators relied on the bit to cut the formation and carry away the cuttings up and around the drill pipe.

Under deeper drilling conditions, the slush pumps were increased in size and volume and higher pressures were required. Under the present practice, well holes are drilled hydraulically and the pressure utilized for circulating fluid through the well is in excess of twenty-four hundred pounds.

The bits maintain the well hole to proper gauge and cut into the hard formations while the pumps circulate the fluid downwardly and thence upwardly to bring the cuttings to the surface.

Under present conditions of drilling deep wells, tests show that the circulation fluid travels upwards of one hundred miles per hour when it reaches the bottom of a ten thousand foot hole and thus the slush pumps, their pistons, rods, and liners, must be constructed and have the capacity for maintaining the fluid in constant action during drilling operations.

Sharp sands have been a menace in causing rapid wear upon the pistons, rods, and liners, but the use of new types of shakers and desanders is eliminating this particular problem.

The high pressures plus the heat caused by constant friction of a rubber piston against a liner during long strokes, develops piston failures. When the lips of the rubber sleeve on the piston are cut, distorted, or become worn, the washing of the fluid by the piston not only washes the piston body but also destroys the expensive liner and the piston rod, and the replacement of these parts involves considerable time, labor, and consequent expense.

A dangerous condition is also developed in the event that the pump becomes inoperative while the pipe is on the bottom of the hole, as loss of pressure may result in a cave-in of the hole, thereby freezing the drill pipe, or a gas pocket may cause a blowout resulting in the loss of the hole. Therefore, it will be understood that good pumps are very essential in the drilling of deep wells.

With the foregoing and other objects in view, my invention consists in certain novel features of construction and arrangement of parts that will be hereinafter more fully described and claimed and illustrated in the accompanying drawing in which:

Fig. 1 is a sectional view of a pump liner and showing my improved piston positioned therein, with parts of said piston in section.

Fig. 2 is a cross section taken on the line 2—2 of Fig. 1.

Fig. 3 is an enlarged detail section taken through the outer portion of the metal ring that carries the rubber ring or body of the piston.

Referring by numerals to the accompanying drawing, 10 designates a conventional pump piston rod provided near its end with a tapered portion 11 that receives the sleeve of the piston and the terminal portion of the rod beyond the tapered portion 11 is threaded as designated by 12.

A sleeve or quill 13 is bored and reamed so as to receive with a precision fit the tapered portion 11 of the piston rod. In some instances, that portion of the rod that receives the sleeve or quill

may have the same diameter throughout its length.

Formed integral with the inner end portion of the sleeve 13 is a circumferential flange 14 provided on one of its side faces with a rib 15. This flange provides a stop for limiting the movement of the ring of the piston inwardly upon said sleeve and the rib 15 is adapted to be embedded in the rubber body of the piston and which is carried by the ring to produce a sealing effect in providing a fluid pressure tight joint.

The outer end portion of the sleeve 13 is externally threaded as designated by 16 for the reception of a nut 17, which latter retains the ring of the piston and the rubber body carried thereby securely in position upon the sleeve 13. When tightened upon the threaded portion 16 of the sleeve 13, the outer end of nut 17 projects a short distance beyond the adjacent end of the sleeve and said nut is locked to the sleeve by means of a lock nut 18 that is screw seated on the threaded end portion 12 of rod 10.

The sleeve 13 when properly seated on the portion 15 of the piston rod, in effect becomes a permanent part of the rod and it is not necessary to remove said sleeve when changing the size of the liner in the pump and which change obviously necessitates a change in the size of the piston.

Formed integral with the inner end portion of the lock nut 17 is a circumferential flange 19 similar to flange 14 on the sleeve 13 and formed on the inner face of said flange 19 is a rib 20 having practically the same construction and function as rib 15.

Removably positioned on the sleeve 13 between the flange 14 and the inner end of lock nut 17 is the body 21 of the piston, said body being preferably formed of steel or similar hard metal and having the form of a ring.

Formed in the side faces of the ring 21 adjacent and concentric with the opening therethrough are grooves 22 which, when the parts of the piston are properly assembled, occupy positions directly opposite the ribs 15 and 20 on the flanges 14 and 19 respectively and said grooves receive ribs or flanges that are formed on the inner portion of the rubber body of the piston.

Formed in the peripheral face of the ring 21 is a plurality of circumferential grooves 23 that receive rib-like portions of the rubber body of the piston when the same is molded or cast upon the ring. The formation of the grooves 23 in the core provides circumferential ribs 24 and also circumferential ribs 25 on the ends of said ring.

Formed in the ribs 24 and extending inwardly toward each other from the side faces thereof are concentric grooves 26 and similar grooves 27 are formed in the inner faces of the ribs 25 at the ends of the ring.

As a result of the construction just described, the outer portions of the ribs 24 are substantially T-shape in cross section and the outer portions of the grooves 23 are substantially of inverted T-shape in cross section.

The flexible or elastic body 28 that is molded on the ring 21 is composed of tough, wear resisting rubber or composition having rubber as one of its principal ingredients, and said body entirely covers that portion of the ring outwardly from the grooves 22 and thus there are no exposed seams or joints exposed to the wash-

ing or cutting action of fluid pressures while the piston is in operation.

Portions 29 of the body of rubber completely fill the grooves 22 and side wall portions 30 completely cover the outer end portions of the ring 21 and a circumferential portion 31 completely covers the outer faces of the ribs 24. The outer face of the circumferential portion 31 is recessed to form a shallow, circumferential, concave groove 32, and as a result of this construction circumferential lips 33 that are substantially wedge-shape in cross section are formed at the edges of the end faces of the rubber body and the outer faces of which lips ride directly against the inner face of the liner L and provide fluid pressure tight joints between the rubber body and said liner.

When the rubber body is molded onto the ring, portions 34 of said body completely fill the grooves 23 and the lateral grooves 26 and 27, thus providing substantially dovetail joints or connections between the outer portion of the rubber body and the ring and such construction effectually prevents outward bulging of the intermediate portion of the rubber body when the piston is subjected to high pressures.

The width of the rubber body forming a part of my improved piston is considerably less than that of the pistons now in general use in slush pumps and the like, and as a result of this narrow construction there is a substantial decrease in the frictional resistance between the rubber and the inner surface of the liner.

The molding of the rubber body in one piece upon the ring provides an exceptionally strong and substantial structure that will withstand high pressures and the rubber body, together with its ring, is held firmly in position upon the sleeve 13 by the flanges 14 and 19 and the sleeve is firmly retained on the piston rod by the nut 18.

After the piston has been installed on the rod and it becomes necessary to replace the rubber body of the piston due to wear or disintegration, it is only necessary to remove the nuts 18 and 17 which permits the ring and rubber body to be readily removed from the sleeve, which latter retains its position upon the piston rod.

A new ring and the rubber body carried thereby is now positioned upon the sleeve and rigidly anchored thereto by applying the lock nut 17 to the threaded end of the sleeve 13 and applying nut 18 to the threaded end of the piston rod. These operations may be accomplished without removing the rod from the pump.

As the pump liners are reduced in diameter, the diameters of the rubber bodies on the sleeves are correspondingly reduced, but the diameter of the sleeve and the sizes of the lock and rod nuts remain the same inasmuch as they are permanent elements of the piston.

Conventional slush pump pistons range in sizes from five inches to nine and one-quarter inches in diameter, but my improved piston may be made in smaller sizes for use in various small size pumps used in the industrial field.

Thus it will be seen that I have provided a slush pump piston that is relatively simple in construction, inexpensive of manufacture and very effective in performing the functions for which it is intended.

It will be understood that minor changes in the size, form and construction of the various parts of my improved slush pump piston, may be made and substituted for those herein shown and described, without departing from the spirit

of my invention, the scope of which is set forth in the appended claims.

I claim as my invention:

1. In a piston for pumps and the like, a piston rod, a sleeve removably positioned thereupon, a ring removably positioned upon said sleeve, a one-piece body of flexible material enclosing the outer portion of said sleeve and interlocking flanges on the external periphery of the ring and the internal periphery of said body of flexible material.
2. A piston as set forth in claim 1 and with means removably mounted upon said sleeve for retaining said ring and flexible covering member upon said sleeve.
3. A piston as set forth in claim 1, with means removably mounted upon said sleeve for retaining said ring and flexible covering member upon said sleeve and means removably mounted on the piston rod for retaining said sleeve and the parts carried thereby upon said piston rod.
4. In a piston for pumps and the like, a piston rod, a sleeve removably mounted on said piston rod, a ring removably mounted on said sleeve, said ring being provided in its peripheral portion with a circumferential undercut groove and in its end faces with grooves, a one-piece body of flexible material entirely enclosing the outer portion of said ring, with portions of said flexible member occupying the undercut grooves in said ring and other portions of said flexible member occupying the grooves in the end faces of said ring.
5. A piston as set forth in claim 4 and the periphery of said flexible body being provided with a shallow, circumferential, concave face.
6. In a piston for pumps and the like, a piston rod, a two-piece sleeve removably positioned upon said rod, a one-piece ring removably positioned upon said sleeve, the peripheral portion of which ring is provided with a plurality of circumferential undercut grooves and a one-piece body of flexible material enclosing the outer portion of said ring, with integral portions of said body anchored in said undercut grooves.

7. A piston as set forth in claim 6 and the periphery of which flexible body is provided with a circumferential, concave face.

8. A piston as set forth in claim 6, with concentric grooves formed in the end faces of said ring, with portions of said body of flexible material occupying said grooves and flanges on the parts of said two-piece sleeve, which flanges bear against those portions of the body of flexible material that are seated in said concentric grooves.

9. The combination with a piston rod, of a two-piece sleeve removably positioned on said rod and a piston body removably positioned on said sleeve and comprising a one-piece ring and one-piece body of flexible material enclosing and anchored upon the outer portion of said ring.

10. The combination with a piston rod, of a sleeve removably positioned thereon, a ring removably positioned on said sleeve, a one-piece body of flexible material enclosing and anchored upon the outer portion of said ring, a nut screw seated on said sleeve for securing said ring and body of flexible material on said sleeve and means removably mounted on said piston rod for securing said sleeve and nut on said piston rod.

11. In a piston for pumps and the like, a piston rod, a two-part sleeve detachably mounted on said piston rod, the parts of said sleeve being adjustably connected to each other, a one-piece ring positioned on said sleeve between the parts thereof, said ring being provided in its periphery and its end faces with grooves, a one-piece body of flexible material entirely enclosing the outer portion of said ring, with portions of said flexible member occupying the grooves in said ring and flanges on the parts of the two-piece sleeve, which flanges bear against those portions of the flexible member that occupy the grooves in the ends of the ring.

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