May 28, 1957 J. T. PHIPPS 2,793,921

PISTON CONSTRUCTION

Filed March 8, 1954 2 Sheets-Sheet 1

Fig. 1.

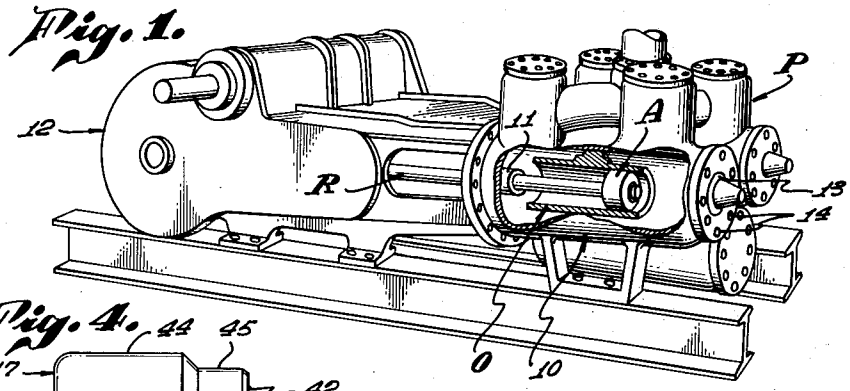


Fig. 4.

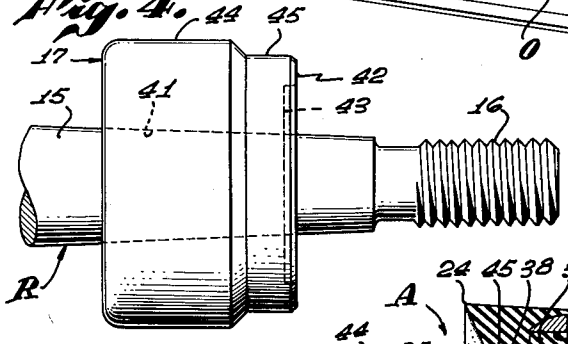


Fig. 2.

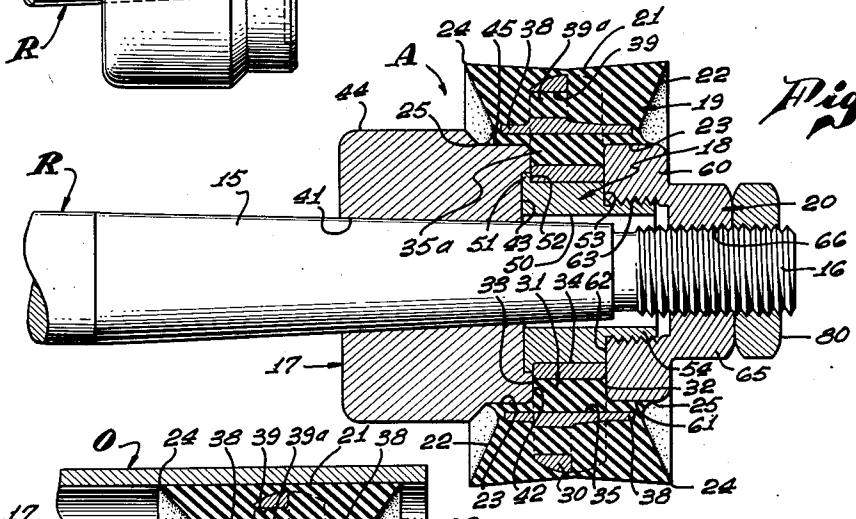
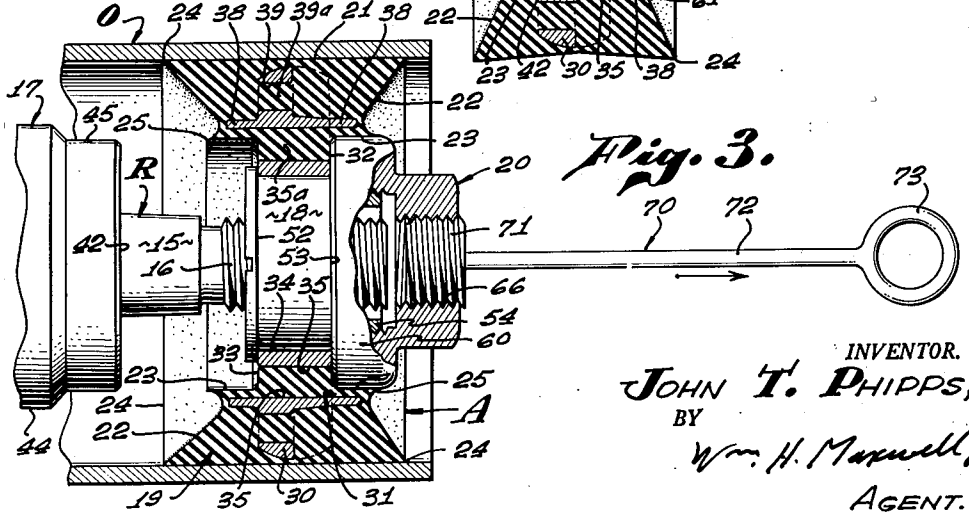


Fig. 3.



INVENTOR.
JOHN T. PHIPPS,
BY
Wm. H. Maxwell Jr.
AGENT.

May 28, 1957 J. T. PHIPPS 2,793,921

PISTON CONSTRUCTION

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Fig. 5.

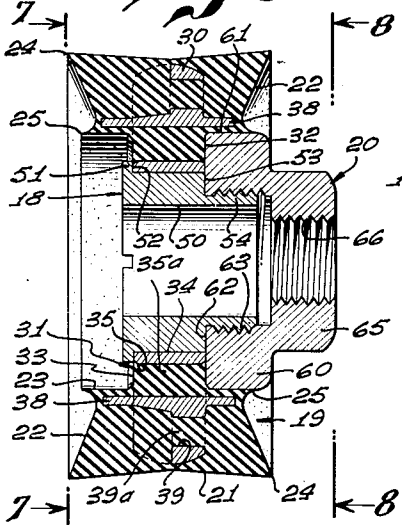


Fig. 6.

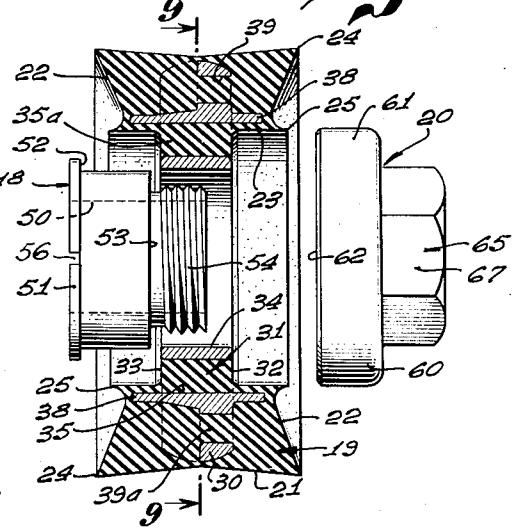


Fig. 7.

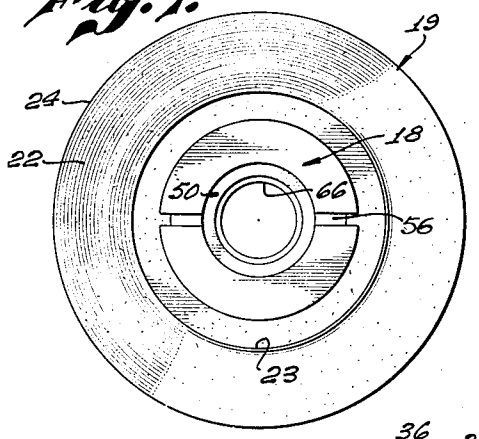
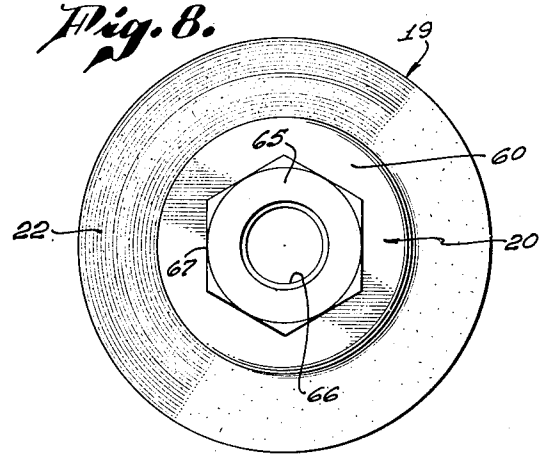


Fig. 8.



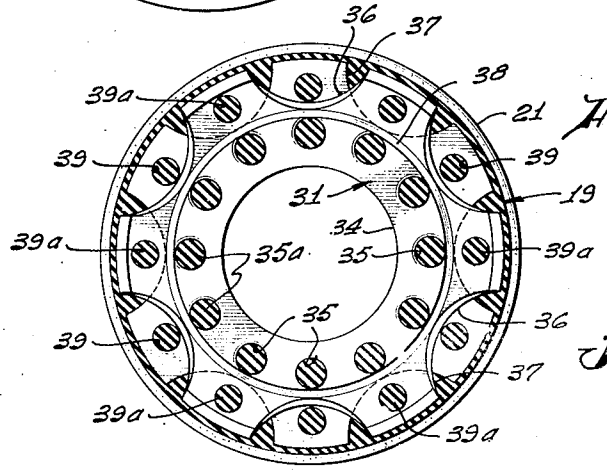


Fig. 9

INVENTOR.
JOHN T. PHIPPS,
BY
Wm. H. Maxwell Jr.
AGENT.

United States Patent Office 2,793,921 Patented May 28, 1957

2,793,921

PISTON CONSTRUCTION

John T. Phipps, Wilmington, Calif.

Application March 8, 1954, Serial No. 414,703

14 Claims. (Cl. 309—4)

This invention has to do with a double acting piston construction adapted for use in a slush pump or the like, wherein abrasive materials or liquids, such as drilling mud, are handled or pumped under high pressure.

Due to the extreme pressures and abrasive nature of the fluids commonly handled by slush pumps, conventional piston constructions are soon worn out or destroyed and must be replaced. Replacement of ordinary or conventional piston constructions in a slush pump generally requires removing or pulling the piston rod from the pump, which operation is costly and time-consuming. Pulling of the piston rod from a slush pump for the purpose of replacing or repairing the piston thereon further requires removal and replacement of the packing in the stuffing box through which the rod extends, which operation requires a further expenditure of time and money.

It is a general object of the present invention to provide an improved double acting piston construction for a slush pump or the like, that can be quickly and easily applied to or removed from the piston rod and inserted into or removed from the cylinder of an ordinary slush pump from the head end thereof and without pulling the rod from the pump.

Another object of the present invention is to provide a piston construction of the general character referred to that employs few parts, each being easy and economical of manufacture and highly effective and dependable in use.

Still another object of the present invention is to provide a piston construction wherein no metal parts engage and wear the cylinder wall of the pump.

Another object of the invention is to provide a piston construction of the character referred to employing one, easily replaceable, inexpensive and highly effective and durable wearing element.

It is another object of the invention to provide a molded rubber piston body having a metallic reinforcing core.

Another object is to provide a piston cylinder engaging piston body with suitable fluid actuated sealing lips at opposite ends thereof.

The various objects and features of my invention will be fully understood from the following detailed description of a typical preferred form and application of the invention, throughout which description reference is made to the accompanying drawings, in which:

Fig. 1 is a perspective view of a typical conventional slush pump having a portion broken away to show the piston construction provided by the present invention arranged therein. Fig. 2 is a longitudinal sectional view of the piston construction that I provide and applied to the end of a typical or conventional slush pump piston rod. Fig. 3 is a longitudinal sectional view of the piston construction that I provide arranged in a pump cylinder in a semi-assembled condition and having a suitable pulling tool engaged therein. Fig. 4 is an elevational view of the stop collar provided by the present invention engaged on the tapered end portion of a typical slush

pump piston rod. Fig. 5 is a sectional view of certain of the parts of my invention engaged with each other to form a sub-assembly of parts. Fig. 6 is an exploded view of the parts forming the sub-assembly shown in Fig. 5. Fig. 7 is an end elevational view taken as indicated by line 7—7 on Fig. 5. Fig. 8 is an end elevational view taken as indicated by line 8—8 on Fig. 5. Fig. 9 is a transverse sectional view of the piston body taken substantially as indicated by line 9—9 on Fig. 6.

In Fig. 1 of the drawings I have shown the piston construction A provided by the present invention cooperatively engaged in a typical slush pump P having an elongate pump chest 10, a cylinder O in the chest, an elongate piston rod R extending into the cylinder and slidably engaged in a suitable stuffing box 11 in one end of the chest, and a suitable drive means 12 spaced from the said end of the chest and operatively connected with the rod. The pump P is further characterized by a head 13 releasably secured to the other end of the chest by suitable screw fasteners 14, and adapted to be removed from the chest 10 to provide access into the chest and to the rod R and piston A arranged in the cylinder O therein.

The piston rod R illustrated throughout the drawings is a typical or standard slush pump piston rod and includes, an elongate body extending through the stuffing box 11 into the pump chest 10 to include within the cylinder O, a forwardly convergent or tapered inner end portion 15 within the cylinder O, and a threaded extension or shank 16 projecting forwardly from the forward terminal end of the said tapered portion 15.

The piston construction A that I provide includes, generally, a stop collar 17 engageable on the tapered extension 15 of the piston rod R, a carrying and retrieving hub 18 engageable around and clear of the rod to abut the stop collar, a piston body 19 carried by the hub to seal with the stop collar and engage the wall of the cylinder O of the pump P, and a follower or retainer 20 engageable on the extension 15 of the rod R and on the hub 18 and adapted to retain the hub 18 engaged with the stop collar 17, the piston body 19 engaged on the hub 18, and also to seal with the piston body 19.

The piston body 19 provided by the present invention is an elongate cylindrical member with a smooth outer peripheral wall 21 adapted to be slidably engaged in the cylinder O of a slush pump or the like, with oppositely facing end walls 22 and a central longitudinal disposed opening 23 extending through the body from one to the other. The piston body is provided with outer fluid actuated sealing lips 24 at each end thereof adapted to establish sealing engagement with the wall of the cylinder O, and inner fluid actuated sealing lips 25 at each end thereof and adapted to establish sealing engagement with the stop collar 17 and with the retainer or follower 20.

The outer sealing lips 24 at the ends of the piston body 19 are circular, longitudinally disposed fin-like extensions of the peripheral and end walls 21 and 22 of the piston body and are established by pitching the outer peripheral wall 21 of the piston body 19 longitudinally and radially inward from each end of the body and pitching the end wall 22 of the body 19 longitudinally and radially inward from the outer peripheral edges thereof. The inner sealing lips 25 at the ends of the piston body 19 adapted to establish sealing engagement with the stop collar 17 and the retainer 20, are established by longitudinally disposed annular fin-like projections about the inner periphery of the body 19, defined by the longitudinal opening 23 extending therethrough.

The piston body 19 is further provided with a suitable core 30 formed of iron or other suitable rigid material. The core 30 provides the piston body with sufficient

strength and rigidity to withstand the severe stresses and strains that are encountered in its normal operation in the cylinder of a pump, without tearing, pulling loose, or otherwise becoming mutilated or rendered prematurely ineffective.

The core 30 is a flat annular member arranged in the piston body 19 to occur midway between the ends thereof. The core 30 is of slightly less outside diameter than the piston body 19, so that its outer periphery is inward of the outer peripheral wall 21 of the body. The inside diameter of the core 30 is of substantially less diameter than the opening 23 in the piston body 19 so that the core 30 projects inwardly into the opening to establish an annular inwardly projecting rib 31 defining forwardly and rearwardly facing shoulders 32 and 33 and a central longitudinal opening 34 substantially less in diameter than the opening 23 extending through the body.

With the above relationship of parts, it will be apparent that the outer cylinder engaging wall 21 of the piston body 19 is unobstructed and that there is no metal part occurring therealong, that will engage and wear the wall of the cylinder O when the piston construction A is operated therein. It will also be apparent that the portion of the core projecting into the opening 23 of the piston body 19 and establishing the rib 31, provides a rigid member that can be advantageously engaged by the hub 18 and clamped between the stop collar 17 and the retainer 20.

It has been found that when metal and rubber are bonded together, little effort is required to separate the rubber from the metal when tensional forces are exerted therebetween, while great forces are required to separate the metal and rubber through shearing action.

The core 30 provided by the present invention has a plurality of circumferentially spaced longitudinally disposed openings 35 extending through the inner peripheral portion thereof, a plurality of circumferentially spaced rearwardly and outwardly opening recesses 36 about the outer periphery thereof, and a plurality of forwardly and outwardly opening recesses 37 about the outer periphery thereof and staggered, or circumferentially offset from the said rearwardly opening recesses 36. The core 30 also has forwardly and rearwardly projecting, longitudinally disposed annular ribs 38 on the sides thereof and arranged between the said openings 35 in the inner peripheral portion of the core and the recesses 36 and 37 in the outer peripheral portion of the core. The annular ribs 38 extend longitudinally of the piston body 19 to occur between the outer peripheral wall 21 and the central opening 23 of the piston body and terminate short of the end walls 22 thereof.

It will be apparent that the rubber, or rubber-like material, of which the piston body 19 is molded or cast, is bonded to the core 30 and extends through the openings 35 in the core to establish inner tie members 35^a integrally joining or tying the rubber material occurring at opposite sides of the core 30 together and radially inward of the annular ribs 38 on the body. The annular ribs 38 extending longitudinally in the body 19 and projecting from the opposite sides of the core 30, provide radial stability for the body and stop or check excessive radial flexure and pulling of the body away from the stop collar 17 and retainer 20 of the piston construction as it is reciprocated in the cylinder O, which flexure and pulling, if not checked, would result in rapid fatigue and tearing of the rubber of which the body is formed.

The staggered or circumferentially offset, oppositely facing and outwardly opening recesses 36 and 37 about the outer periphery of the core 30 that I provide, establish increased longitudinally disposed bonding surfaces for the rubber about the outer periphery of the core. The added or increased surfaces established by the recesses 36 and 37 in the core 30 are adapted to overcome the longitudinal forces that tend to pull the rubber from the core by providing additional longitudinal bonding surfaces that will transmit the longitudinal forces exerted on and through the rubber piston body to the core through shearing action.

It will be apparent that the opening 35 and ribs 38 of the core 30 also provide longitudinal bonding surfaces for the rubber on the core, in addition to the particular ends for which they are intended.

The outer peripheral portions of the core 30 between the recesses 36, occur adjacent the recesses 37 in the other or opposite side of the core to establish bottoms in the recesses 36, which bottoms restrict excessive longitudinal flow or movement of the rubber in the recesses 36 when the piston body is in operation. In like manner the outer peripheral portions of the core between the recesses 36 occur adjacent and close the recesses 37 to restrict excessive longitudinal movement or flow of the rubber occurring in the recesses 37 when the piston is in operation.

The outer peripheral portion of the core between the recesses 36 and 37 are provided with longitudinal openings 39 through which the rubber of which the body is formed extends to establish outer tie members 39^a integrally joining or tying the rubber, or rubber-like material, occurring at opposite sides of the core together at points radially outward of the annular ribs 38 on the body.

In the preferred carrying out of the invention, the circumferential extent of the outer peripheral portions of the core occurring between the recesses 36 and 37 is slightly less than the circumferential extent of the recesses, so that the edge portions of the recesses 36 and 37 overlap and are in open communication with each other at their side edges. With the above relationship of parts, the rubber occurring in the recesses 36 is integrally joined to the rubber in the recesses 37, which joinder further insures against separation or pulling apart of the rubber occurring at opposite sides of the core and in the recesses.

From the above it will be seen that the core 30 provided by the present invention is highly effective in maintaining the piston body 19 in proper working position and is such that the molded rubber mass of which the body 19 is formed, will not tear off or otherwise become disengaged from the core.

It is to be understood that the piston body 19 is reversible, that is, it can be turned end for end, and that the particular forward and rear ends of the body referred to above is for the purpose of illustration only.

The stop collar 17 provided by the present invention is an elongate body round in cross sectional configuration and is characterized by a central forwardly convergent or tapered opening 41 adapted to receive and establish tight wedging engagement with the tapered end portion 15 of the piston rod R. The stop collar 17 is provided with a flat wall or face 42 at its forward end and a centrally located counterbore 43 in the face 42 concentric with and surrounding the opening 41.

In the preferred carrying out of the invention the outer peripheral wall 44 of the stop collar 17 is provided at its forward end with a portion of reduced diameter adapted to be slidably engaged in the opening 23 of the piston body 19 at the rear end thereof and engage the rearwardly facing shoulder 33 defined by the rib 31 in the body, and to establish an outwardly facing annular seat 45 adapted to cooperate with the inner sealing lip 25 on the rear end of the piston body 19.

The hub 18 is an elongate cylindrical member adapted to carry the piston body 19 and to facilitate removal of the body from within the cylinder of a pump. The hub 18 is provided with a central, longitudinal opening 50 extending therethrough adapted to freely receive and pass the tapered end portion 15 of the piston rod R. The hub 18 corresponds in diameter and longitudinal extent with, and is slidably engageable in, the opening 34 in the rib 31 established by the core 30 in the piston body 19. The hub 18 is provided with an enlargement or head 51

at its rear end corresponding in longitudinal and radial extent with, and is engageable in, the counterbore 43 in the stop collar 17 to center the hub and piston body on the collar and around the rod when the piston construction is assembled. The head 51 on the hub 18 establishes a forwardly facing stop shoulder 52 projecting radially outward from the peripheral wall of the hub to occur in a substantially parallel plane with the forwardly facing end face 42 on the stop collar 17 when the head is engaged in the counterbore 43. The hub 18 further includes a forward end face 53 and an externally threaded extension 54 of reduced diameter projecting forwardly from the end face 53 to extend beyond the forward end of the rod and overlie a portion of the extension 16 on the rod.

It will be apparent from the above, that when the stop collar 17, hub 18 and piston body 19 are assembled the rear end of the piston body 19 overlies and seals with the forward end portion of the stop collar and the rearwardly facing shoulder 33 of the rib 31 in the body 19 established by the core 30, engages the forward end face 42 on the stop collar and the forwardly facing shoulder 52 on the retrieving and carrying hub 18. The forwardly facing shoulder 32 defined by the rib 31 and the forward end face 53 on the hub 18 occur in a common plane and are flush with each other.

The follower or retainer 20 that I provide is adapted to be engaged with the hub 18 to retain the piston body 19 thereon and also to engage the threaded shank 16 of the rod R to maintain the hub 18 and the piston body 19 on the rod and in tight butting engagement with the stop collar 17.

The retainer 20 is provided with an elongate cylindrical rear end portion 60 having a longitudinally disposed annular sealing face 61 slidably engageable in the opening 23 in the piston body from the forward end thereof and adapted to establish sealing engagement with the forward inner sealing lip 25 on the body, a flat rearwardly facing end wall 62 adapted to establish flat butting engagement with the forwardly facing shoulder 32 defined by the rib 31 in the piston body and the front end face 53 on the hub. The rear end portion 60 of the retainer is further provided with a central, internally threaded longitudinally disposed socket opening 63 adapted to receive and engage the threaded extension 54 on the hub to maintain the hub 18, piston body 19, and retainer 20 in tight assembly. The retainer 20 is further provided with a forward end portion 65 with a central internally threaded opening 66 extending therethrough and adapted to receive and engage the threaded extension 16 on the end of the rod R to hold the hub 18 and piston body 19 in engagement with the stop collar 17.

In practice, the stop collar 17 is independently or separately applied to the tapered end portion 15 of the piston rod R in the manner illustrated in Fig. 3 of the drawings, to have tight wedging engagement therewith, and need never be removed therefrom. While the hub 18, piston body 19 and retainer 20 are engaged together in the manner illustrated in Fig. 4 of the drawings to form a sub-assembly of parts, prior to insertion and engagement of the said parts into the pump cylinder and with the rod R and collar 17. With the above relationship of parts it will be apparent that the various parts of my piston construction forming the sub-assembly referred to above, can be advantageously assembled or disassembled, and worn or damaged parts repaired or replaced, at a location removed from the pump.

It will also be apparent from the above that the piston construction A that I provide can be advantageously engaged on the piston rod R and in the cylinder O of the slush pump P, through the head end of the pump chest 10 by simply removing the head 13 therefrom, and that the piston rod R need not be pulled or removed from the pump.

In the preferred carrying out of the invention, the rearmost end of the head 51 on the hub 18 is provided with a tool engaging slot 56, and the forward end portion 65 of the retainer 20 is provided with a plurality of tool engaging flats 67 about its peripheral wall, to facilitate assembly or disassembly of the structure.

To facilitate insertion or removal of the above mentioned sub-assembly of parts from within the cylinder O, I provide a suitable pulling tool 70 having a threaded body 71 engageable in the threaded opening 66 in the rear end portion 65 of the retainer 20, an elongate stem 72 projecting forwardly from the body 71, and a suitable tool engaging head 73 on the forward terminal end of the stem and accessible at the exterior of the cylinder O, or if desired at the exterior of the chest 10 of the pump.

To apply the subassembly of parts, shown in Fig. 5 of the drawings, to the piston rod R upon which the stop collar 17 is initially engaged, the piston rod R is moved to its foremost position or stroke, the subassembly is then engaged in the cylinder from the open forward end thereof (see Fig. 5) so that the threaded extension 16 of the rod enters the threaded opening 66 in the retainer 20, whereupon rotation of the subassembly by means of a suitable tool engaged with or on the flats 67 on the portion 65 of the retainer, establishes threaded engagement between the retainer and the rod and advances the subassembly of parts into tight engagement with the stop collar 17 on the rod and into the cylinder O of the pump P. In practice, a suitable lock nut 80 is engaged on the outer terminal end of the rod extension 16 to abut the outer end of the retainer 20 to maintain the retainer and extension 16 in tight threaded engagement.

To remove the subassembly, or disassemble the piston construction A, it is only necessary to reverse the above procedure, that is, remove the lock nut 80 and unscrew the retainer 20 from the end of the piston rod R. It will be apparent that upon removal or unscrewing of the retainer 20 from the extension of the piston rod R, the retrieving and carrying hub 18 and piston body 19 carried thereby are withdrawn from engagement with the piston rod and stop collar 17, whereupon the pulling tool 70 that I provide can, if necessary, be engaged in the retainer 20, in the manner illustrated in Fig. 3 of the drawings, and the subassembly of parts withdrawn from within the cylinder O of the pump.

At no time, during application or removal of the piston construction A onto the piston rod R, is the rod rotated or moved longitudinally in the pump. The above feature is highly significant since it prevents damage and misalignment of the rod and packing in the stuffing box 11 in the pump.

Having described only a typical preferred form and application of my invention, I do not wish to be limited or restricted to the specific details herein set forth, but wish to reserve to myself any variations or modifications that may appear to those skilled in the art and fall within the scope of the following claims.

Having described my invention, I claim:

1. A pump piston construction adapted to be engaged on the end of a piston rod having a thread extension including, a cylindrical stop collar with a flat front face releasably engaged on the rod, an elongate cylindrical hub smaller in diameter than the collar and freely engageable around the rod to abut the face on the collar, an elongate cylindrical piston body formed of rubber, an inwardly projecting annular rib in the body midway between the ends thereof and slidably engaged on and surrounding the hub, a forwardly projecting threaded extension on the hub, an elongate cylindrical retainer with a rear end portion corresponding in diameter with the stop collar and threadedly engaging the extension on the hub and a forward end portion threadedly engaging the extension on the rod, the retainer holding the hub and body in tight assembly and in fixed position on the rod and against the collar, and the body slidably receiving and sealing around the collar and the retainer.

2. A pump piston construction adapted to be engaged on the end of a piston rod having a forwardly tapered end portion and a forwardly projecting threaded extension including, a cylindrical stop collar with a central forwardly convergent longitudinal opening and a flat front face releasably engaged on the tapered portion of the rod, an elongate cylindrical hub with a central longitudinal opening and freely receiving the said portion of the rod to abut the face on the collar, the hub being smaller in diameter than the collar, an elongate cylindrical piston body formed of rubber, an inwardly projecting annular rib in the body midway between the ends thereof and surrounding the hub, a forwardly projecting extension on the hub, an elongate retainer with a rear end portion corresponding in diameter with the stop collar and threadedly engaged on the extension on the hub and a forward end portion threadedly engaged on the extension on the rod, the retainer holding the hub and body in tight assembly, and the assembly tight on the rod and against the collar, and the body slidably receiving and sealing around the collar and the retainer.

3. A pump piston construction adapted to be engaged on the end of a piston rod having a thread extension including, a cylindrical stop collar with a flat front face releasably engaged on the rod in fixed position thereon, an elongate cylindrical hub smaller in diameter than the collar and freely engaged around the rod to abut the face on the collar, a radially elongate cylindrical piston body formed of rubber, an inwardly projecting annular rib in the opening in body midway between the ends thereof and slidably engaging and surrounding the hub, a forwardly projecting externally threaded extension on the hub, an elongate retainer with a rear end portion corresponding in diameter with the stop collar and having a rearwardly opening internally threaded socket opening receiving the extension on the hub and a forward end portion with an internally threaded longitudinal opening receiving the extension on the rod, the retainer holding the hub and body in tight assembly and the assembly on the rod and tight against the collar, and the body slidably receiving and sealing around the collar and the retainer.

4. A pump piston construction adapted to be engaged on the end of a piston rod having a forwardly tapered end portion and a forwardly projecting threaded extension including, a cylindrical stop collar with a central forwardly convergent longitudinal opening and a flat front face releasably engaged on the tapered portion of the rod in fixed position thereon, an elongate cylindrical hub with a central longitudinal opening freely engageable around the said portion of the rod to abut the face on the collar, the hub being smaller in diameter than the collar, an elongate cylindrical piston body formed of rubber, a radially inwardly projecting annular rib in the opening in the body midway between the ends thereof and slidably engaged on and surrounding the hub, a forwardly projecting externally threaded extension on the hub, an elongate retainer with a rear end portion corresponding in diameter with the stop collar and having a rearwardly opening internally threaded longitudinal opening receiving the extension on the rod, the retainer holding the hub and body in tight assembly and the assembly on the rod and in tight engagement against the collar, and the body slidably receiving and sealing around the collar and the retainer.

5. A pump piston construction adapted to be engaged on the end of a piston rod having a forwardly tapered end portion and a forwardly projecting threaded extension including, a cylindrical stop collar engageable on the rod in fixed position thereon and having a central forwardly convergent longitudinal opening receiving the tapered portion of the rod, a flat front face and a forwardly opening counterbore in the face, an elongate cylindrical hub smaller in diameter than the collar and having a central longitudinal opening larger in diameter than the rod and receiving the tapered portion of the rod, a head on the rear end of the hub and engageable in the counterbore in the collar and defining a forwardly facing shoulder flush with the face on the collar, an elongate cylindrical piston body formed of rubber, an inwardly projecting annular rib in the body midway between the ends thereof corresponding in longitudinal extent with and surrounding the hub, a forwardly projecting extension on the hub, an elongate retainer with a rear end portion corresponding in diameter with the stop collar, and releasably engaging the extension on the hub and a forward end portion releasably engaging the extension on the rod, the retainer holding the hub and body in tight assembly and the assembly on the rod and in tight engagement against the collar, and the body slidably receiving and sealing around the collar and the retainer.

6. A pump piston construction adapted to be engaged on the end of a piston rod including, a cylindrical stop collar engageable on the rod, a cylindrical hub smaller in diameter than the stop collar and engageable around the rod and against the stop collar, a cylindrical retainer corresponding in diameter with the stop collar and threadedly engaged on the hub and on the rod, an elongate cylindrical rubber piston body with a central longitudinal opening slidably receiving the stop collar and the retainer, and having a metallic core intermediate its ends and projecting inwardly in the opening to occur between the stop collar and the retainer and slidably receiving and surrounding the hub, the core having circumferentially spaced longitudinally disposed openings extending therethrough and receiving rubber tie members extending between the body occurring at opposite sides of the core.

7. A pump piston construction adapted to be engaged on the end of a piston rod including, a cylindrical stop collar engageable on the rod in fixed position thereon, a cylindrical hub smaller in diameter than the stop collar and freely engageable around the rod and against the stop collar, a cylindrical retainer corresponding in diameter with the stop collar and threadedly engaged on the hub and on the rod, an elongate cylindrical rubber piston body with a central longitudinal opening slidably receiving the stop collar at one end and the retainer at the other end, and having a metallic core intermediate its ends and projecting radially inwardly to occur between the stop collar and the retainer and surrounding the hub, the core having circumferentially spaced radially outwardly opening notches about its outer periphery to establish longitudinally disposed bonding surfaces for the rubber body.

8. A pump piston construction adapted to be engaged on the end of a piston rod including, a cylindrical stop collar engageable on the rod in fixed position thereon, a cylindrical hub smaller in diameter than the stop collar and freely engageable around the rod and against the stop collar, a cylindrical retainer corresponding in diameter with the stop collar and threadedly engaged on the hub and on the rod, an elongate cylindrical rubber piston body with a central longitudinal opening slidably receiving and sealing around the stop collar and the retainer, and having a metallic core intermediate its ends and projecting radially inwardly in the opening to occur between the stop collar and the retainer and slidably engaged on and surrounding the hub, the core having circumferentially spaced longitudinal openings receiving tie members integrally joining opposite ends of the body together, and circumferentially spaced outwardly opening notches providing longitudinal bonding surfaces for the rubber body on the core.

9. A pump piston construction adapted to be engaged on the end of a piston rod including, a cylindrical stop collar engageable on the rod in fixed position thereon, a cylindrical hub smaller in diameter than the stop collar and freely engageable around the rod and against the stop collar, a cylindrical retainer corresponding in diame-

ter with the stop collar and threadedly engaged on the hub and on the rod, an elongate cylindrical rubber piston body with a central longitudinal opening slidably receiving and sealing around the stop collar and the retainer, and having a flat radially disposed metallic core intermediate its ends and projecting radially inwardly in the opening to occur between the stop collar and the retainer and slidably engaged on and surrounding the hub, the core having annular stiffening ribs projecting longitudinally from opposite sides of the core to occur with the body and surrounding the collar and the retainer in spaced relationship thereto.

10. A pump piston construction adapted to be engaged on the end of a piston rod including, a cylindrical stop collar engageable on the rod in tight fixed engagement therewith, a cylindrical hub smaller in diameter than the stop collar and freely engageable around the rod and against the stop collar, a cylindrical retainer corresponding in diameter with the stop collar and threadedly engageable with the hub and with the rod, an elongate cylindrical rubber piston body with a central longitudinal opening slidably receiving the stop collar and the retainer from its opposite ends, and having a flat radially disposed annular metallic core intermediate its ends and projecting radially inwardly to occur between the stop collar and the retainer and surrounding the hub, the core having circumferentially spaced longitudinal openings receiving tie members extending between the body occuring at opposite sides of the core and having annular stiffening ribs projecting longitudinally from opposite sides of the core to occur within the body and overlying the collar and the retainer.

11. A pump piston construction adapted to be engaged on the end of a piston rod including, a cylindrical stop collar engageable on the rod in tight fixed engagement therewith, a cylindrical hub smaller in diameter than the stop collar and freely engageable around the rod and against the stop collar, a cylindrical retainer corresponding in diameter with the stop collar and threadedly engageable with the hub and on the rod, an elongate cylindrical rubber piston body with a central longitudinal opening slidably receiving and sealing around the stop collar and the retainer, and having a flat annular radially disposed metallic core intermediate its ends and projecting radially inwardly in the opening in the body to occur between the stop collar and the retainer and slidably engaged on and surrounding the hub, the core having annular stiffening ribs projecting longitudinally from opposite sides of the core to occur within the body and overlying the collar and the retainer, and having inner and outer rows of circumferentially spaced longitudinal openings receiving tie members extending between the body occurring at opposite sides of the core the said inner and outer rows of openings occurring at opposite sides of the annular ribs.

12. A pump piston construction adapted to be engaged on the end of a piston rod including, a cylindrical stop collar engageable on the rod in tight fixed engagement therewith, a cylindrical hub smaller in diameter than the stop collar and freely engageable around the rod and against the stop collar, a cylindrical retainer corresponding in diameter with the stop collar and threadedly engageable with the hub and with the rod, an elongate cylindrical rubber piston body with a central longitudinal opening slidably receiving the stop collar and the retainer at its opposite ends, and having a flat annular radially disposed metallic core intermediate its ends and projecting inwardly to occur between the stop collar and the retainer and surrounding the hub, the core having circumferentially spaced forwardly and outwardly opening notches and circumferentially spaced rearwardly and outwardly opening notches about its outer periphery to establish longitudinal bonding surfaces for the rubber body, and having annular stiffening ribs projecting longitudinally from opposite sides of the core to occur within the body.

13. A pump piston construction adapted to be engaged on the end of a piston rod including, a cylindrical stop collar engageable on the rod in fixed position thereon, a cylindrical hub smaller in diameter than the stop collar and freely engageable around the rod and against the stop collar, a cylindrical retainer corresponding in diameter with the stop collar and threadedly engageable on the hub and on the rod, an elongate cylindrical rubber piston body with a central longitudinal opening slidably receiving the stop collar and the retainer at its opposite ends, and having a flat annular radially disposed metallic core intermediate its ends and projecting radially inwardly in the opening in the body to occur between the stop collar and the retainer and surrounding the hub, the core having circumferentially spaced longitudinal openings about the inner peripheral portion and receiving tie members integrally joining opposite ends of the body together, circumferentially spaced outwardly opening notches about the outer periphery providing longitudinal bonding surfaces for the rubber body on the core, and annular stiffening ribs between the notches and the openings and projecting from opposite sides of the core.

14. A pump piston construction adapted to be engaged on the end of a piston rod including, a cylindrical stop collar engageable on the rod in fixed position thereon, a cylindrical hub smaller in diameter than the stop collar with a straight outer peripheral wall and freely engageable around the rod and against the stop collar, a cylindrical retainer with a straight outer peripheral wall and corresponding in diameter with the stop collar and threadedly engageable with the hub and the end of the rod, an elongate cylindrical body formed of rubber and having an outer cylinder engaging surface, a central longitudinally disposed opening slidably receiving the stop collar and the retainer, an annular metallic reinforcing core in the body with a portion projecting radially inwardly into the opening in the body to establish a rib in the body intermediate its ends and occurring between the collar and the retainer and slidably engaging and surrounding the hub, the body having outer fluid actuated sealing lips at each end thereof to seal with a cylinder wall and inner fluid actuated sealing lips at each end thereof and sealing with the outer peripheral walls of the collar and the retainer.

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