

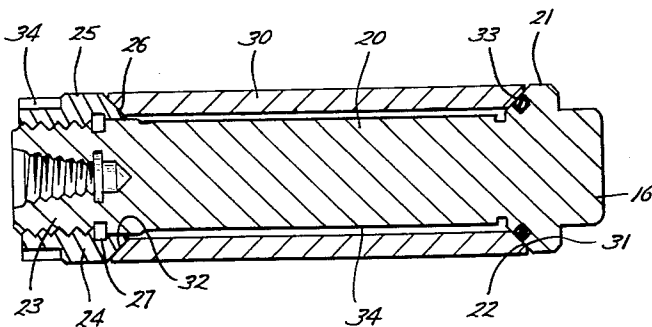
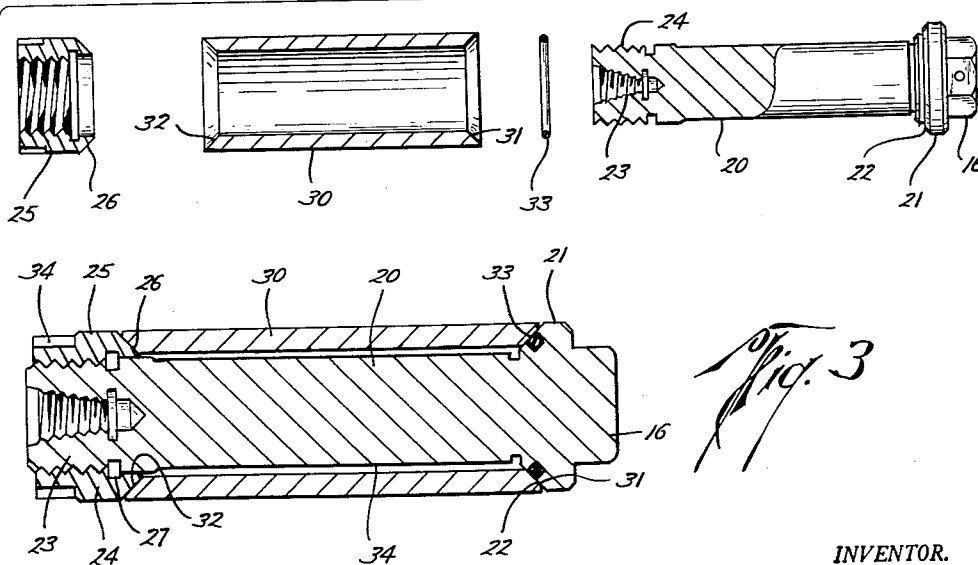
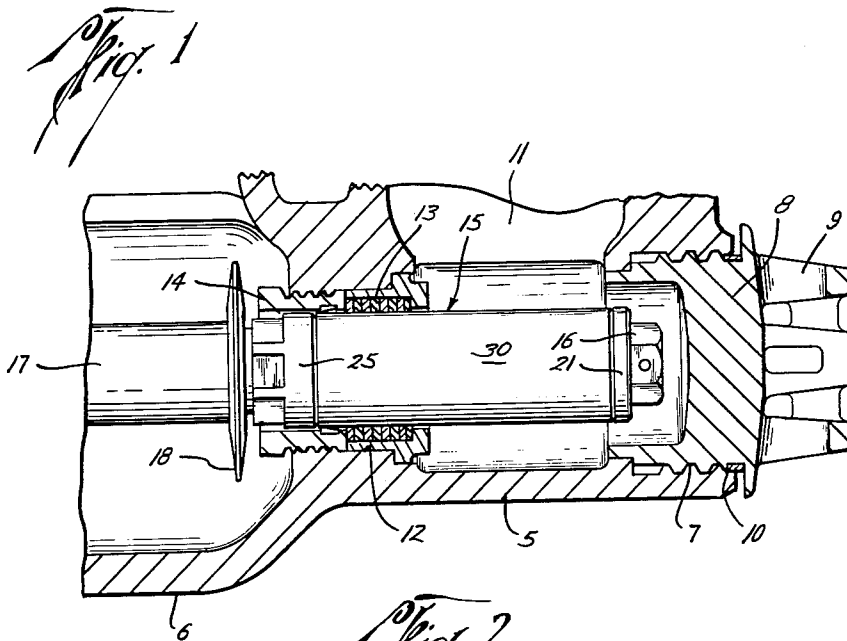
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PUMP PLUNGER CONSTRUCTION

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PUMP PLUNGER CONSTRUCTION

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This invention relates to pumps, particularly single-acting, plunger-type, mud or slush pumps as used in the oil fields.

The plungers of such pumps must work in a stuffing box in the end of the cylinder and, consequently, are subject to substantial wear. Accordingly, provision must be made for frequent repair or replacement of the plunger as its surface wear becomes excessive. It has been customary to purchase and/or stock complete replacement pump plungers since, so far as I am aware, it has not been possible heretofore to economically repair such plungers, especially in the field. Since the plungers are relatively heavy and expensive parts, their replacement in accordance with the usual practice is expensive due to the cost of the part as well as the cost of its shipment, frequently on an emergency basis, to the point of field repair.

It is the main object of the present invention to provide a pump plunger of the above type which may be economically repaired in the field without the necessity of replacing the entire pump body.

A more detailed object is to provide such a pump plunger with a replaceable wear sleeve which may be easily replaced by unskilled personnel.

Another object is to provide a pump plunger of the above type having a replaceable wear sleeve and built-in means to center the sleeve relative to the axis of the plunger body without the necessity of accurately fitting the entire opposing walls of the plunger body and sleeve.

Still another object is to provide such a pump plunger having a replaceable wear sleeve in which the plunger body and sleeve have complementary, inclined, frusto-conical engaging surfaces which automatically insure sealing and centered mounting of the sleeve upon the pump body.

In accordance with the present invention, the pump plunger comprises a body having at one end means for attachment to the plunger actuating extension as well as an external thread for application of a nut having an inclined, circumferential shoulder. At the other end, the body is provided with wrench attaching structure to facilitate attachment of the plunger to its actuating extension and also having an inclined, annular shoulder facing outwardly and toward the annular shoulder on the previously mentioned nut. A replaceable wear sleeve has annular end surfaces inclined in correspondence to the shoulders on the nut and body for insuring centering and sealing mounting of the sleeve upon the body.

In the accompanying drawing which illustrates the invention:

FIG. 1 is a vertical, longitudinal section through a pump cylinder and plunger embodying the invention.

FIG. 2 is a disassembled view of the plunger.

FIG. 3 is an enlarged section through the plunger disassembled from the cylinder and actuating extension.

FIG. 1 illustrates a working cylinder 5 which is connected to the crank case (not shown) of the pump motor by cage structure 6. One end of the cylinder is internally threaded, as at 7, for mounting a removable cover 8 having wrench accommodating structure 9 and sealing packing 10. The usual fluid intake and exhaust ports communicate with the cylinder, one being shown at 11. The opposite end of the cylinder is apertured, as at 12, and provided with a packing gland, generally indicated at 13,

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and a packing nut 14 externally threaded for screwing into the end of cylinder body aperture 12.

The pump plunger, generally indicated at 15, has a hexagonal projection 16 at its right hand end for receiving a plunger removing and installing wrench. The exterior surface of the plunger is slidably and sealingly received in packing gland 13, and, at its left hand end, is threadedly secured, as will be explained, to an actuating plunger extension 17, which reciprocates in cage 6 and carries a flexible mud baffle 18.

The plunger structure is illustrated in detail in FIGS. 2 and 3. The main or central part of the plunger is formed by an elongated, generally cylindrical body 20 from the right hand end of which projects the previously mentioned hexagonal, wrench-receiving element 16. Just inwardly of element 16 there is provided on the body an annular shoulder 21 having an annular, inclined face 22. At the opposite end of body 20 there is provided a tapered, longitudinal, threaded aperture 23 into which a similarly shaped projection on plunger extension 17 is threaded. The left hand end of the body is externally threaded at 24 for receiving a nut element 25 having an annular shoulder forming surface 26 inclined in opposition to shoulder forming surface 22 previously mentioned. A sealing packing 27 is provided between element 25 and the body.

A removable wear sleeve 30 of hollow, cylindrical shape has radially inclined end surfaces 31 and 32 which are received between and snugly fit against inclined shoulders 22 and 26, respectively, on the body and nut element 25. An O-ring seal is provided at 33 between mating body and sleeve surfaces 22 and 31. The pairs of mating surfaces 22, 31 and 26, 32 on the body and nut and on the sleeve are accurately formed so that engagement of these surfaces insures accurately centered as well as sealing mounting of the sleeve on the body. Clearance is provided between the main portions of the opposing sleeve walls as shown at 34 in FIG. 3, so that no effort need be made to insure accurate fitting of these walls. Nut 25 has wrench accommodating indentations 34.

The procedure in changing wear sleeve 30 upon excessive wear thereof is as follows:

First, cylinder cover 8 is removed. Then, the entire plunger is removed from actuating extension 17 by application of a wrench to projection 16. Next, nut element 25 is unscrewed and the worn sleeve 30 slid longitudinally to the left and off the body. A new sleeve is then placed in position against body shoulder 22 and nut element 25 replaced and drawn snugly against the corresponding end of the sleeve element. No fitting or machine operations are required to insure proper seating of the sleeve. The plunger with the new sleeve mounted thereon is then inserted through the open end of the cylinder and through packing gland 13, which is retightened as required, and threadedly attached to actuating extension 17. With the reapplication of cover 8 the pump is again ready for operation.

The use of my invention permits the stocking in the field of the relatively light, inexpensive wear sleeves 30, or, if necessary, such sleeves can be shipped, even by air, relatively inexpensively. Moreover, the repair of the plunger can be effected by unskilled personnel using ordinary tools. Accordingly, the durability as well as the efficient and economical operation of the pump are substantially increased.

The invention may be modified in various respects as will occur to those skilled in the art and exclusive use of all modifications as may come within the scope of the appended claims is contemplated.

I claim:

1. In a pump, a working cylinder having apertures

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in its opposite ends, a plunger having a body inserted through a first of said apertures, means at one end of said body for attachment of actuating means, means at the opposite end of said body for detaching said body from said actuating means, longitudinally-spaced, opposite-inclined, outwardly-facing shoulders on said body, a wear sleeve mounted on said body between said shoulders and sealingly received in said last-mentioned aperture, said body and said sleeve otherwise clearing said cylinder, said sleeve having inclined end surfaces complementary to and sealingly engaging said body shoulders for axially centering said sleeve, and a plug in the other of said cylinder end apertures which is removable for access to and removal and reinsertion of said plunger.

2. In a pump, a working cylinder having apertures in its opposite ends, a plunger having a body inserted through one of said apertures, a pair of longitudinally-spaced, outwardly-facing, inclined shoulders on said body, and axially concentric therewith, a wear sleeve mounted on said body and substantially spaced therefrom between said shoulders, said sleeve having inclined end surfaces complementary to and sealingly engaging said body shoulders for centering said sleeve, wrench engaging means at the end of said body within said working cylinder, a threaded connection at the opposite end of said body for attachment to actuating means, and a plug in the second of said cylinder end apertures and remov-

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able for introduction of wrench means to effect detachment, removal and reinsertion of said plunger there-through, one of said body shoulders being removable to facilitate replacement of said sleeve.

3. In a pump, a working cylinder having apertures in its opposite end, a plunger having a body inserted through a first of said apertures, a pump actuator threadedly secured to one end of said body, there being longitudinally-spaced, outwardly-facing annular shoulders on said body, a replaceable wear sleeve mounted on said body with inclined end surfaces complementary to and sealingly engaging said body shoulders but otherwise substantially spaced from said body, a removable plug in the second of said end apertures to facilitate removal and reinsertion of said plunger therethrough for replacing said wear sleeve, and a wrench attaching projection on the end of said plunger body adjacent said plugged end for releasing said plunger from said pump actuator.

References Cited in the file of this patent

UNITED STATES PATENTS

2,413,347	Hamilton et al. -----	Dec. 31, 1946
2,528,104	Young -----	Oct. 31, 1950

FOREIGN PATENTS

905,900	France -----	Apr. 30, 1945
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