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W. T. CALDWELL

2,155,180

PUMP LINER

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Fig. 1.

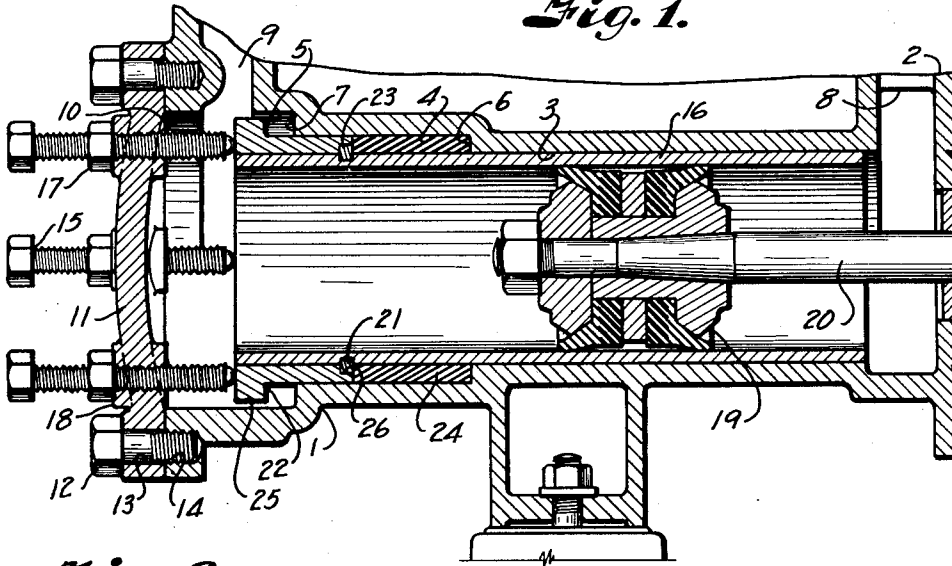


Fig. 2.

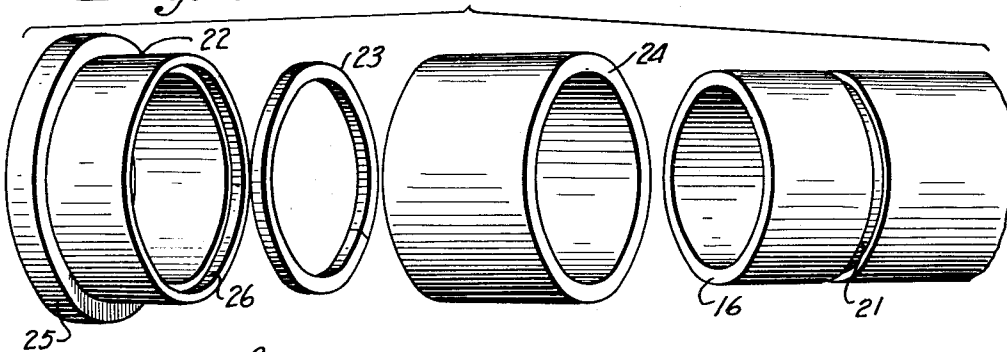
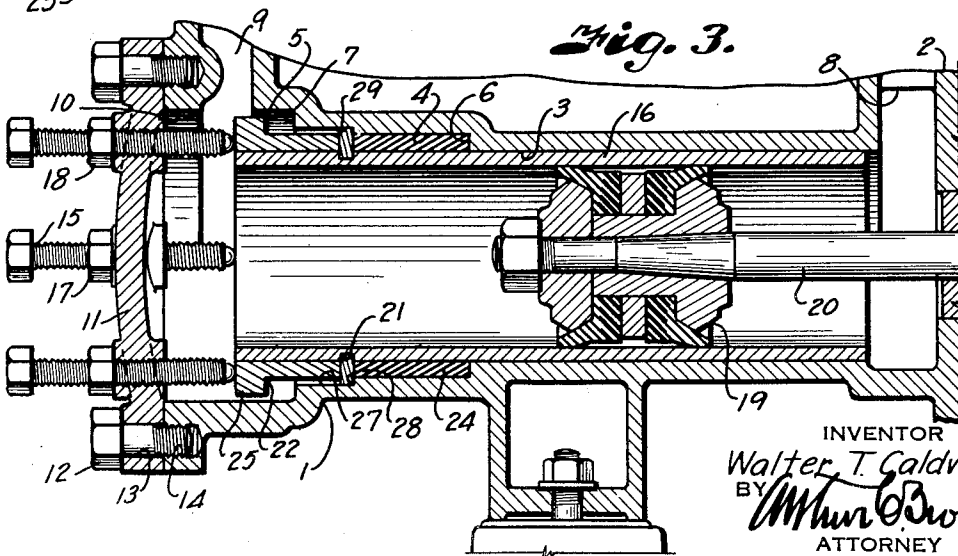


Fig. 3.



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PUMP LINER

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4 Claims. (Cl. 309—3)

This invention relates to pumps and similar devices that are ordinarily equipped with cylinder liners, and has for its principal object to provide a cylinder liner that is relatively simple and inexpensive to manufacture and which has a minimum of machining operations.

Other important objects of the invention are to provide a cylinder liner that is easily removed when worn and readily replaced with a new liner; to provide a simplified means for retaining the liner and packer within a cylinder; and to provide a liner that may be constructed from standard tubular stock material.

In accomplishing these and other objects of the invention, as hereinafter pointed out, I have provided improved details of structure, the preferred forms of which are illustrated in the accompanying drawing, wherein:

Fig. 1 is a section through the cylinder of a pump, such as adapted for delivering a well drilling fluid or slush used in rotary well drilling operations.

Fig. 2 is a detail perspective view of one end of a liner with the packing and liner retaining members being shown in disassembled spaced relation.

Fig. 3 is a section similar to Fig. 1, showing a modified form of the invention.

Referring more in detail to the drawing:

1 designates the cylinder portion of a pump 2 for delivering a fluid under pressure, for example a well drilling fluid. The cylinder 1 has a longitudinal bore 3 that is provided at the head end thereof with stepped counterbores 4 and 5 forming annular shoulders 6 and 7.

Formed integrally with the respective ends of the cylinder are the usual fluid passageways 8 and 9 leading to and from the respective valves (not shown). The head end of the cylinder is provided with an opening 10 of substantially the diameter of the counterbore 4 and which is normally closed by a cylinder head 11, the cylinder head 11 being retained by cap screws 12 that extend through openings 13 in the head and into threaded sockets 14 in the cylinder, as in accordance with present practice.

Threadedly supported within the cylinder head are set screws 15, arranged in circular series in substantial alignment with the shoulder 7 for retaining a cylinder liner 16, the set screws being retained in adjusted position by jam-nuts 17 that engage against bosses 18 on the outer face of the cylinder head. Slidable in the cylinder liner is a piston 19 that is actuated by a piston rod 20, as in conventional practice.

With exception of the cylinder liner 16, the parts above described are illustrative of a standard form of pump and specifically form no part of the present invention. The cylinder liner 16 is shaped so that it may be formed from a standard tubular section, of suitable outer diameter to snugly engage within the bore 3 and of a length to accommodate the stroke of the piston 19. The head end of the liner is provided with an annular groove 21 that is spaced inwardly from the end thereof so as to accommodate a retaining bushing or gland 22 ahead of the groove. Engageable within the groove is a split ring 23 that is of suitable outer diameter to slide freely within the counterbore 4, when the liner is inserted in the cylinder bore 3, to engage the end of a packing ring 24 that is wedged against the shoulder 5 to seal the liner relatively to the cylinder. The retainer bushing 22 comprises a sleeve-like ring having an inner diameter of suitable size to slide freely upon the liner and an outer diameter to slip within the open end of the counterbore 4. Formed on the ring is an annular flange 25 that is adapted to be engaged by the ends of the set screws 15, as shown in Fig. 1. The inner end of the ring has a counter-groove or seat 26 for the split ring.

In installing a liner constructed as described, it is passed into the bore 3 of the cylinder through the opening 10 in the head thereof. The packing ring 24 is then inserted in the counterbore 4, whereupon the split ring 23 is slipped over the projecting end of the liner and moved into engagement with the groove 21. The ring then acts to compress the packing ring. The retainer bushing 22 is sleeved over the liner so that the counter-groove 26 in the end face thereof engages against the projecting portion of the split ring. The head 11 is applied and secured in position by the cap screws, whereupon the adjusting screws are manipulated to tighten the liner assembly within the bore 3 and compress the packing 24 so as to maintain the seal about the liner. The retainer engaging against the split ring and being acted upon by the set screws, securely retains the liner in position against thrusts of the piston.

When it is necessary to remove the liner for replacement, as in the case of wear, the head 11 is removed and the entire liner withdrawn, carrying the retainer bushing and split ring 21. The packing 24 may then be removed whereupon a new packing ring and liner are inserted. The split ring is then slipped into position to engage

in the groove of the liner and the retainer bushing reapplied as above described.

• In the form of the invention illustrated in Fig. 3, the counterbore 4 is provided with a counterbore 27 to provide a shoulder 28 that is located in alignment with the groove in the liner. A split ring 29 is used which is of sufficient diameter to engage in the groove and abut against the shoulder 28 to compress the packing, when the retainer bushing is applied and moved into position upon adjustment of the screws 10.

From the foregoing it is obvious that I have provided a cylinder liner that may be formed of standard tubular stock material and which requires only machining of the groove 21 for accommodating the ring 23. The liner is, therefore, of simple and inexpensive construction and is adapted to be adequately retained within the cylinder.

What I claim and desire to secure by Letters Patent is:

1. In combination with a cylinder provided with a bore having a packing retaining recess, a liner for the bore having a substantially uniform over all diameter throughout the length thereof, and provided with an annular groove spaced from the end of the liner registering with said recess, a ring engaged in said groove and of larger outer diameter than the liner to form a packing engaging shoulder and a retainer engaging shoulder, a packing sleeve over the liner and retained in said recess by abutting engagement of said packing engaging shoulder, a retaining member sleeved over the liner and engaging the other of said shoulders, and means for urging the retaining member into engagement with said ring to retain the liner in said bore and effect seal of the packing.

2. In combination with a cylinder provided with a bore having a packing retaining recess, a liner for the bore having a substantially uniform over

all diameter throughout the length thereof, and provided with an annular groove spaced from the end of the liner registering with said recess, a split ring having an inner diameter conforming to the diameter of the groove whereby the ring is adapted to be expanded over the liner and snapped into said groove, said ring being of larger outer diameter than the liner to form a packing engaging shoulder and a retainer engaging shoulder, a packing sleeved over the liner and retained in said recess by abutting engagement of said packing engaging shoulder, a retaining member sleeved over the liner and engaging the other of said shoulders, and means for urging the retaining member into engagement with said ring to retain the liner in said bore and effect seal of the packing.

3. In combination with a cylinder provided with a bore having a shouldered packing retaining recess, a liner for the bore having a substantially uniform over all diameter throughout the length thereof, and provided with an annular groove spaced from the end of the liner registering with said recess, a ring engaged in said groove and having its outer edge engaging said shoulder of the recess, a packing sleeved over the liner and retained in packing relation with said recess by said ring, a retaining member sleeved over the liner and engaging the ring, and means pressing the retaining member into engagement with said ring to retain the liner in said bore and effect seal of the packing ring.

4. A cylinder liner having a substantially uniform over all diameter throughout the length thereof, and provided with an annular groove and a ring removably engaged in said groove and of larger outer diameter than the liner to form a packing engaging shoulder and a retainer engaging shoulder on the respective sides thereof.

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