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R. KIRKPATRICK ET AL
SLEEVE TYPE SLUSH PUMP LINER

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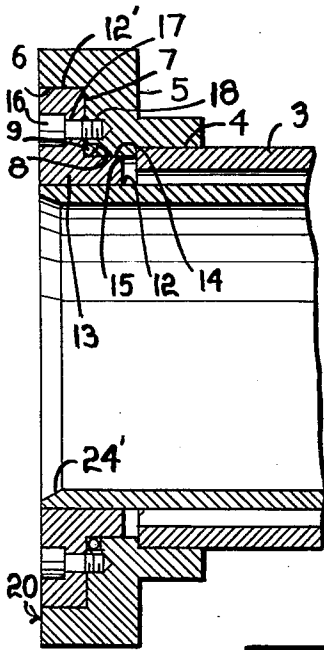


Fig. 1

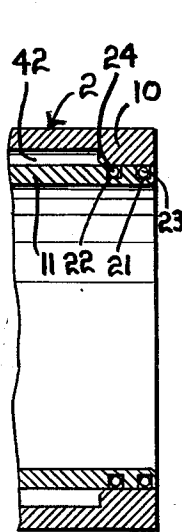


Fig. 2

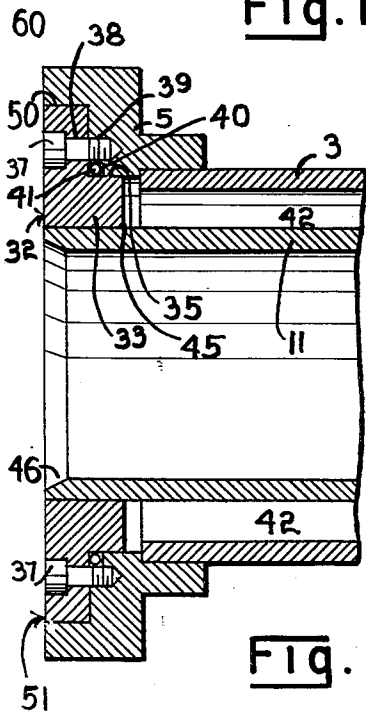
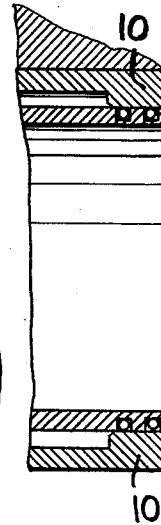
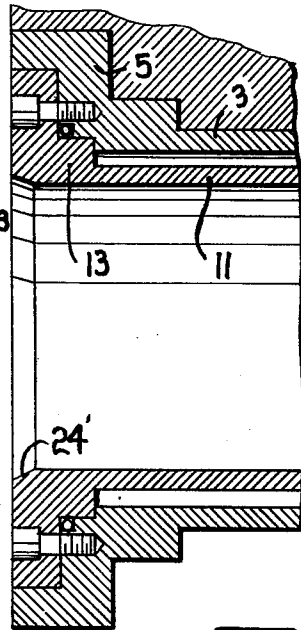


Fig. 3

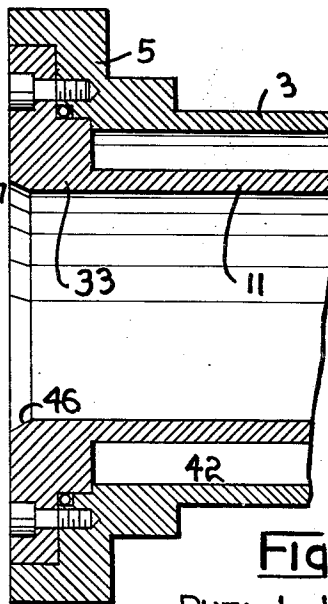
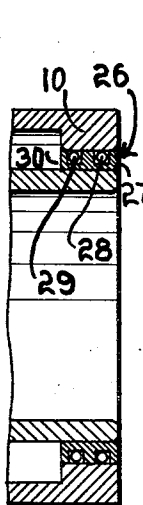


Fig. 4

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SLEEVE TYPE SLUSH PUMP LINER

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4 Claims. (Cl. 309—3)

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The invention relates to a sleeve type liner assembly for cylinders, and in particular to a liner for a pump.

An object of the invention is to provide a pump liner assembly of a simple construction which is of such formation that it is adapted to be firmly positioned in a cylinder of a pump while in use.

Another object of the invention is to provide a sleeve type pump liner assembly of a simple construction which is of such formation that it is adapted to be firmly positioned in a cylinder of a pump while in use, and which assembly includes a liner therein which may be easily and quickly removed and replaced.

Another object of the invention is to provide a pump liner assembly comprising a tubular sleeve and replaceable liner removably secured together, which may be firmly positioned in place in a cylinder.

Still another object of the invention is to provide a pump liner assembly adaptable to operate with pistons of various size bores which assembly includes a removable liner firmly secured to a sleeve, which has seal means between the liner and sleeve to prevent leakage of pumped fluid therebetween.

A further object of the invention is to provide a sleeve type liner assembly comprising a tubular sleeve to be positioned in a cylinder and a replaceable liner fitting in the sleeve, the liner being connected to the sleeve at only one end so that longitudinal displacement of the liner during operation will not be transmitted to the sleeve.

In the drilling of wells by the rotary method, it is customary to pump a fluid down a string of pipe and into the well bore. To this end, a pump commonly called a mud pump is used on the location to circulate the gritty fluid. These fluids are usually highly abrasive and tend to wear various parts of the pump rapidly. For this reason it is necessary to provide removable liners for the pumps which can be removed and replaced as desired, thereby obviating the necessity of replacing each pump as it becomes worn out. Of course, time is lost, when the pump is broken down, in removing and replacing the liner therein. This invention is directed primarily to a liner adapted to be secured firmly in position during the operation of the pump, but which may be removed without difficulty upon occasion.

Other and further objects and advantages of the invention will become more readily apparent from a consideration of the accompanying drawings in connection with the following description, wherein—

Fig. 1 is a vertical sectional view of a form of the invention;

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Fig. 2 is a vertical sectional view showing a structural modification thereof; and

Figs. 3 and 4 are modifications of the invention having liners therein which are adapted for use with pistons of various size bores.

The liner assembly is shown generally at 2 in Fig. 1. The assembly comprises an elongated tubular sleeve 3 arranged to pass through and fit snugly in a pump cylinder. The forward or head end of the sleeve 3 is connected by suitable means such as welds at 4, or sweat joints, to an upstanding or outwardly extending shoulder or flange 5. This flange has therein the counterbore 6, so that the base or bottom thereof constitutes a seating surface 7 for the liner 11.

An annular notch or groove 8 is provided in the counterbore 4 to receive a seal ring 9. At the opposite end of the tubular sleeve 3, an annular inwardly extending flange 10 is provided thereon to abut the liner 11 and position such liner with respect to the tubular sleeve. The liner 11 is connected at 12 to an outwardly extending shoulder or flange 13 which is arranged to seat in the counterbore 6 on the seating face 7 provided therefor. The surface 14 of the flange 5 is arranged so as to be in sliding engagement with the surface 15 of the flange 13. The sealing means 9 prevents the entry of fluid between the sleeve 3 and the liner 11.

Suitable means are provided such as the allen screws 16, which pass through the holes 17 in the flange 13 and, thence into the flange 5 at 18, to releasably secure the liner and sleeve together. It is to be noted that the depth of the counterbore 6 is such that the length of the end face 12' of the flange 13, when seated on the seating face 7, will form a flush joint with the flange 5 as shown at 20.

Adjacent the inward flange 10 on the sleeve 3, the liner 11 is provided with annular grooves 21 and 22 on the periphery thereof, arranged to receive sealing means 23 and 24 which further serve to inhibit the entry of fluid between the sleeve and the liner.

In Fig. 2, the flange 13 is formed integrally with the liner 11, and the flange 5 is formed integrally with sleeve 3. This construction obviates the necessity of connecting the flange 5 to the sleeve 3, and the flange 13 to the liner 11, as by the welds or sweat joints. The liner 11 is shown as being tapered at 24'.

Figs. 3 and 4 show a liner assembly construction wherein the liner is of various sizes arranged to fit various piston sizes. To this end there is provided adjacent the flange 10 on the end of the sleeve, a packing assembly 26 comprising an an-

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nular ring 27 which is provided with notches thereon to receive the seal rings 28 and 29.

The width 30 of this seal ring 27 will be such so as to fill the gap between the flange 10 and the liner 11. In order to position the liner 11 at the head end of the sleeve, an adapter ring 32 is provided in the form of a flange 33 arranged to seat in the counterbore 6 and on the face 7 thereof. The thickness of this adapter ring 32 is adapted to be in sliding engagement with the inner periphery of the flange 5 at 35 thereby firmly positioning the liner in the sleeve.

Allen screws 37 are provided to pass through the conforming passage 38 in the flange 33 and into the flange 5 at 39, thereby securing the liner 11 to the sleeve 3. A notch or groove 40 in the flange 5 adjacent the outer periphery of the flange 33 is provided with seal means 41 to prevent fluid leakage between the flanges 5 and 33 and into the space 42 between the sleeve 3 and liner 11. The adapter ring 32 may be secured by any suitable means such as a weld or a sweat joint as at 45 to secure the ring to the liner 11. A taper 46 is provided which extends downwardly and outwardly on the end of the liner 11. This taper is similar to the taper 24' shown in Fig. 1.

Attention is directed to the construction as shown whereby the depth of the counterbore 6 is equal to the depth of the shoulder 50 on the flange 33 so that when the liner 11 and sleeve 3 are secured together by means of the allen screws, the whole presents a flush surface as shown at 51.

In Fig. 4, the flange 5 and the flange 33 are shown as being formed as a part of the sleeve 3 and liner 11 respectively. This obviates the necessity of securing such flanges in position on the sleeve and liner. Various sizes of adapter rings 32, in the form of the flanges 33, may be provided so that any size piston bore may be accommodated by the construction.

It is to be noted that the sleeve 3 and liner 11 are secured together at only one end 60 of the assembly. Thus as the piston moves back and forth in the liner during operation of the pump, there is a tendency to longitudinally displace the liner relative to the sleeve. The constant back and forth movement has heretofore been transmitted from the liner directly to the surrounding cylinder which tends to increase wear on the pump parts. The seal means on the opposite end of the liner assembly is so arranged that it can move on the annular inwardly extending flange so that a seal is maintained between the liner and sleeve at all times even though the two are capable of being displaced relatively longitudinally. The space 42 between the sleeve 3 and liner 11 takes up any radial displacement in the liner that might occur.

In customary pump construction a header plate, not shown, is usually bolted in position over the cylinder during operation. This plate is provided with bolts extending therethrough and arranged to abut against the liner assembly to retain it in position.

To position the present construction of sleeve type liner assembly in the cylinder, it is only necessary that the header plate be removed and the assembly 2 positioned in the cylinder bore. The header plate is then replaced and bolted in position. The bolts extending through the header plate are then adjusted to contact the flush surface 20 around the liner assembly whereby the whole is firmly secured in place.

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The invention claimed is:

1. A compound pump cylinder liner comprising, a tubular sleeve adapted to fit in the cylinder, an outwardly extending counterbored flange on one end thereof, a piston-receiving tubular liner adapted to pass through said sleeve, an outwardly extending flange on an end of said liner adapted to fit within the counterbore of said sleeve flange to position said liner therein, seal means disposed between said flanges, means extending through said liner flange and into said sleeve flange for securing the two together and seal means disposed between said sleeve and said liner adjacent the other end thereof to maintain a seal between said sleeve and said liner while permitting relative axial motion therebetween.

2. A pump cylinder liner assembly comprising, a tubular sleeve adapted to fit in the cylinder, an outwardly extending counterbored flange on one end thereof to seat the sleeve in the cylinder, a tubular piston receiving liner adapted to pass through said sleeve, means on an end of said liner arranged to engage and seat within the counterbore of said flange, seal means disposed between said engaging means and said flange, and seal means disposed between said sleeve and said liner adjacent the other end thereof to maintain a seal between said sleeve and said liner while permitting relative axial motion therebetween.

3. A pump cylinder liner assembly comprising, a tubular sleeve adapted to fit in the cylinder, an outwardly extending flange on one end thereof to seat the sleeve in the cylinder, there being a counterbore in said flange, a tubular piston receiving liner adapted to pass through said sleeve, means on an end of said liner arranged to seat within the counterbore of said flange to position said liner in said sleeve, means for securing said engaging means in the counterbore of said flange, and seal means disposed between said sleeve and said liner adjacent the other end thereof to maintain a seal between said sleeve and said liner while permitting relative axial motion therebetween.

4. A pump liner assembly comprising, a tubular sleeve having a counterbore in an end thereof, a tubular liner having a flange on an end thereof of a width to fit snugly within said counterbore so that the end surfaces of said liner and sleeve are in alignment, a seal between said flange and said counterbore, means in said liner and passing into said sleeve to lock said sleeve and liner together, and seal means disposed between said sleeve and said liner adjacent the other ends thereof to maintain a seal between said sleeve and said liner while permitting relative axial movement therebetween.

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