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CYLINDER LINER

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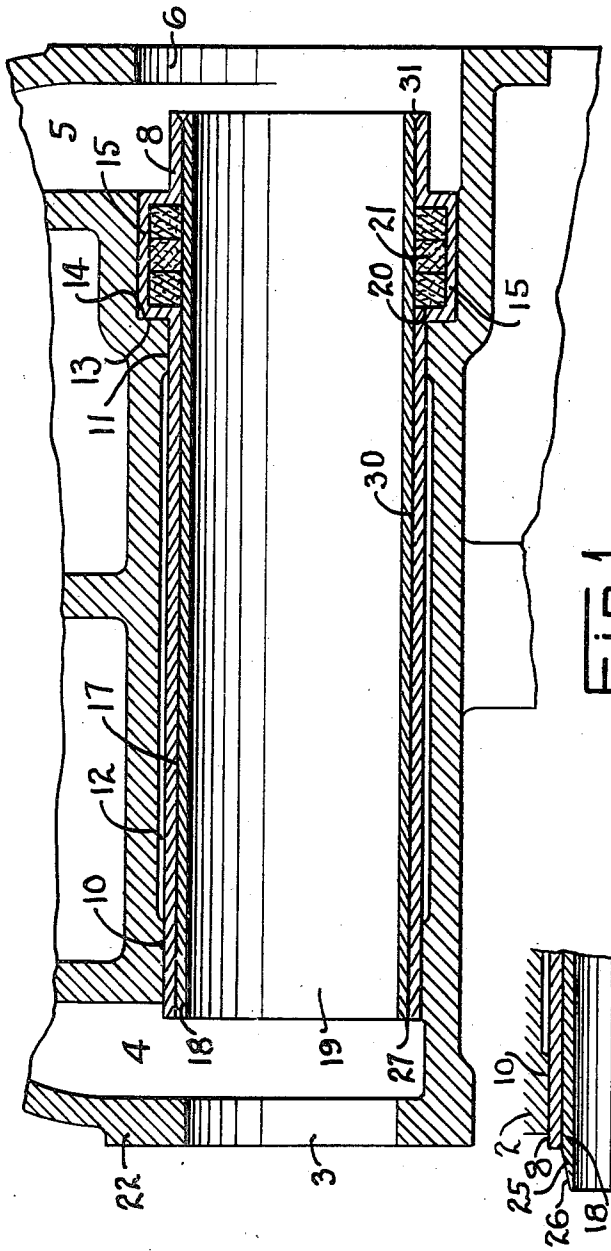


Fig. 1.

Fig. 2.

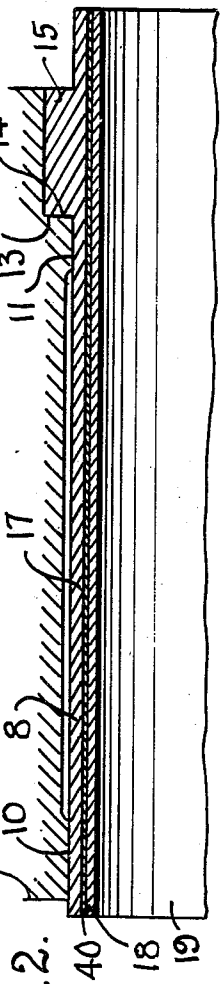


Fig. 3.

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CYLINDER LINER

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10 Claims. (Cl. 309—3)

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The invention relates to a pump liner insert whereby the service obtainable from a pump liner is substantially extended and the liner is adaptable for various size pistons.

In the operation of various types of pumps a cylindrical liner is removably positioned in the pump so that when it is subjected to wear that it can be replaced in a minimum of time. With many types of pumps and particularly where an abrasive liquid is being circulated such as the slush pumps used to pump the drilling fluid in the rotary method of drilling wells, the liners are subjected to high pressures and are subject to considerable abrasion.

Various expedients have been tried such as case hardening, flame hardening and alloy coating of the liners. These expedients have extended the service of the liner somewhat, but the present invention contemplates an insert which may be positioned in a liner after it has rendered the maximum of service whereby the liner is renewed and an additional extended service may be obtained.

It is therefore one of the objects of the present invention to provide the combination of a pump liner and a removable insert therein.

Another object of the invention is to provide an insert for slush pump liners which can be pressed into position in the liner so as to provide a working surface.

Another object of the invention is to introduce and seal an insert in a slush pump liner.

Another object of the invention is to provide in combination with a slush pump liner an insert and a sealing medium there around to prevent leakage between the liner and insert.

Another object of the invention is to provide the inside surface of a slush pump liner with a packing assembly to form a seal about an insert which is thereafter introduced into the liner.

Another object of the invention is to seal an insert in a slush pump liner.

Still another object of the invention is to provide an insert for a slush pump liner which is of hard wear resistant material so as to provide a maximum of service.

Other and further objects of the invention will be readily apparent when the following description is considered in connection with the accompanying drawings wherein:

Fig. 1 is a vertical sectional view through a portion of a slush pump liner and insert assembly in accordance with the invention.

Fig. 2 is a broken detailed sectional view showing the end arrangement of the insert as it is introduced into the liner.

Fig. 3 shows a modified arrangement for sealing the insert in the liner.

The slush pump body is indicated generally at 2 and has the opening 3 therein for the reciprocation of the piston rod and the chamber 4 for

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the inlet and outlet of the pumped liquid. The chamber 5 at the opposite end is for the liquid pumped by the other end of the piston while the opening 6 is arranged to receive any suitable clamping devices for holding the liner 8 in position. Various types of clamping devices can be used and it is not deemed necessary to illustrate them for the purpose of this invention.

A pump body is usually provided with the bearing or support surfaces 10 and 11 which are spaced axially of the opening 12. A shoulder 13 serves as a stop for a complementary shoulder 14 on the outstanding flange 15 of the liner 8. The liner 8 may be a new liner which has been equipped with the insert 18 which has the cylindrical bore 19 or it may be a liner which has seen previous service and has been worn to such an extent that the inner surface thereof is uneven, worn irregularly or worn to such a size that the pistons no longer maintain a seal therewith. Under these circumstances the inside of the liner will be machined or otherwise treated to provide a relatively smooth surface 17 of such a size to receive the insert 18.

In Fig. 1 in order to insure a seal between the insert and the liner the flange 15 of the liner has had a recess 20 machined therein from the inside of the liner and a plurality of packing rings 21 are shown as having been disposed in this recess.

The insert 18 may be prepared of any suitable material which is sufficiently hard to resist abrasion and of a suitable thickness so that the bore 18 thereof will be of a size to receive standard diameter pistons. By a hard insert it is contemplated that the surface of the insert will have a Brinell hardness approximating 700.

The insert will be of a size to fit snugly within the surface 17 of the liner and the forward end 25 of the insert 18 may be tapered at 26 to facilitate the passing of the packing 21 as the insert is forced into the liner. It is contemplated, of course, that the insert will be positioned in the liner in a suitable hydraulic press and in actual practice the liners have been inserted in a hydraulic press at a pressure of 65 tons. After the insert has been properly positioned the tapered end 26 may be cut away so that the liner and insert will present a smooth end 27 as seen in Fig. 1. If desired the right hand ends of both the liner and the insert may be beveled as at 31 and a bead of welding material placed therein if desired. One of the essential features is that there be a seal at the interface 30 between the outer periphery of the insert and the inner periphery of the liner so that there will be no leakage or escape of liquids from one side of the pump to the other. It will be noted that the packings 21 form a tight seal with the periphery of the

liner and the liner is now ready for insertion in the pump.

It seems obvious that the liner 8 may be an entirely new liner constructed to receive the insert 18 or that it may be any liner which has seen service and which can be rebored to receive an insert. If it is desired that the size or capacity of pump be changed or that the pump be equipped to accommodate a different size or smaller piston then an insert may be provided which will have sufficient thickness to make it adaptable for the purpose intended.

Fig. 3 shows a modified arrangement of the insert wherein the inner surface 17 of the liner 8 is the same as in Fig. 1 except that the flange 15 has not been recessed. The insert 18 will be coated with a suitable sealing material 40 and the liner pressed into position under hydraulic pressure. With this construction, the packing 21 has been omitted and the seal accomplished by the semi-plastic or sealing material 40. Various types of material may be utilized which have sufficient adhesive qualities on the one hand to hold the insert in place and sufficient body on the other hand to insure the formation of a seal.

A relatively thin insert of the type here shown can be made much harder than can an entire liner due to the volume of metal present in the liner. The insert has a relatively thin wall thickness so that it can be completely hardened much more uniformly and more readily than can the heavier liner.

The provision of the insert permits a substantial saving in expensive steels because the liner can be made up of any suitable metal rather than of a material which will present a working surface.

When an insert becomes worn it may be replaced and the liner structure used indefinitely which effects a substantial saving on the one hand while extending the service and satisfactory operation of the pump on the other hand.

What is claimed is:

1. A liner assembly for slush pumps comprising a hollow cylindrical liner body, a retainer flange rib projecting from the periphery thereof, a recess cut into the inner periphery of said liner, a plurality of packing rings fitted into said recess, and an insert of a hard wear resistant material forced into said liner.

2. A liner assembly for slush pumps comprising a hollow cylindrical liner body, a retainer flange rib projecting from the periphery thereof, a recess cut into the inner periphery of said liner, a plurality of packing rings fitted into said recess, and an insert of a hard wear resistant material forced into said liner, and means to retain said insert.

3. A liner assembly for slush pumps comprising a hollow cylindrical liner body, a retainer flange rib projecting from the periphery thereof, a recess cut into the inner periphery of said liner, a plurality of packing rings fitted into said recess, and an insert of a hard wear resistant material forced into said liner through said packing so as to provide a seal against leakage along the insert.

4. A liner assembly for slush pumps comprising a hollow cylindrical liner body, a retainer flange rib projecting from the periphery thereof, a recess cut into the inner periphery of said liner, a plurality of packing rings fitted into said recess, and an insert of a hard wear resistant material forced into said liner and a cement like compound on the periphery of said insert.

5. A cylinder liner assembly comprising a cylinder liner, means thereon to be engaged in holding such liner in working position, and an insert sleeve of a size to be fitted into said liner under pressure, said insert being of a hard wear resistant material to provide a working surface.

6. A cylinder liner assembly comprising a cylinder liner, means thereon to be engaged in holding such liner in working position, an insert sleeve of a size to be fitted into said liner under pressure, said insert being of a hard wear resistant material to provide a working surface, and means to form a seal between said liner and insert sleeve.

7. A cylinder liner assembly comprising a cylinder liner, means thereon to be engaged in holding such liner in working position, an insert sleeve of a size to be fitted into said liner under pressure, said insert being of a hard wear resistant material to provide a working surface, and means to form a seal between said liner and insert sleeve comprising a series of packings.

8. A cylinder liner assembly comprising a cylinder liner, means thereon to be engaged in holding such liner in working position, an insert sleeve of a size to be fitted into said liner under pressure, said insert being of a hard wear resistant material to provide a working surface, and means to form a seal between said liner and insert sleeve comprising a coating of sealing material.

9. A cylinder liner assembly comprising a cylinder liner, means thereon to be engaged in holding such liner in working position, an insert sleeve of a size to be fitted into said liner under pressure, said insert being of hard wear resistant material to provide a working surface, and means to form a seal between said liner and insert sleeve, said liner and sleeve each being beveled at one end to provide a groove, and a bead of welding material in said groove.

10. A liner assembly for a slush pump comprising a liner in a cylinder, means thereon whereby the liner may be affixed in the cylinder, and a relatively thin insert of hard wear resistant material sealed on the inside of said liner to provide a working surface for the slush pump piston.

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