Feb. 8, 1955 V. R. MATTINGLY ET AL 2,701,743

LINER ASSEMBLY

Filed July 22, 1949

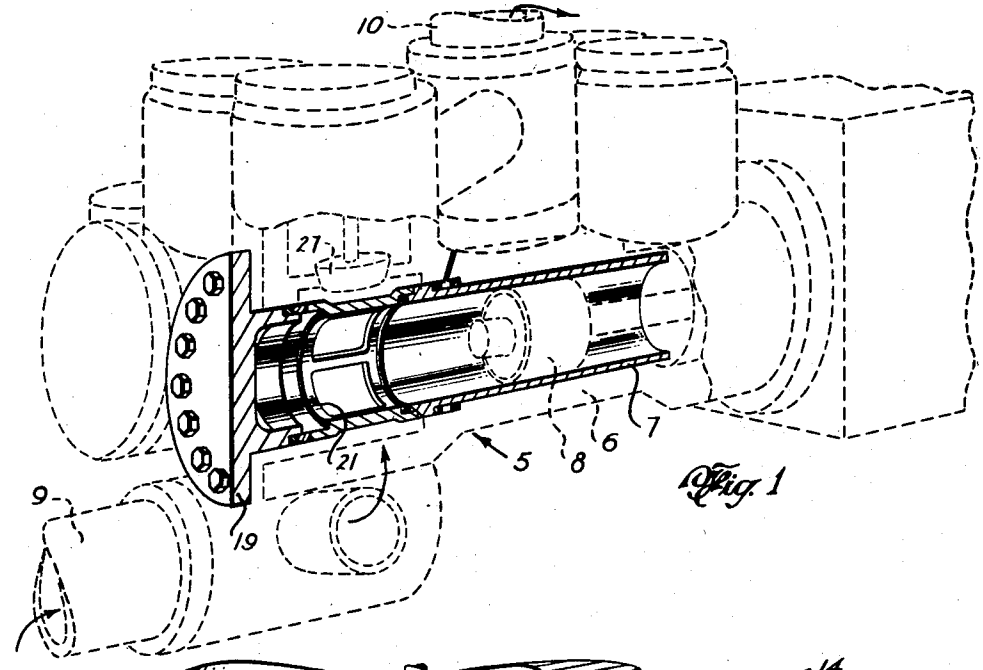

Fig. 1

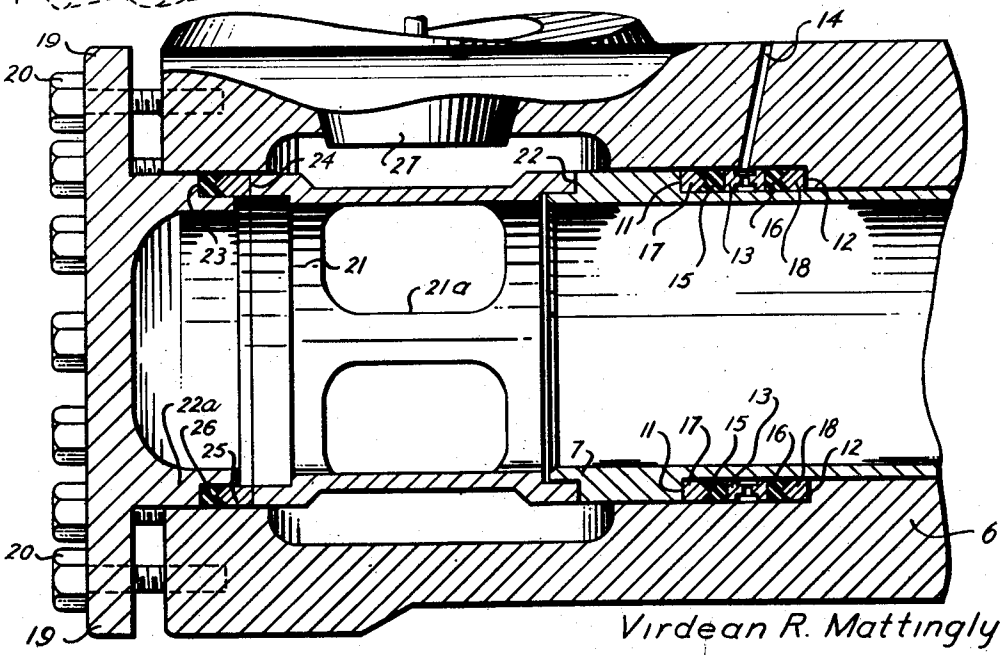

Fig. 2

Virdean R. Mattingly
George C. Mallory
INVENTORS

BY Browning & Simms
ATTORNEYS

United States Patent Office 2,701,743 Patented Feb. 8, 1955

2,701,743

LINER ASSEMBLY

Virdean R. Mattingly, Houston, Tex., and George C. Mallory, New Iberia, La., assignors to Mattco, Inc., Houston, Tex., a corporation of Texas

Application July 22, 1949, Serial No. 106,234

4 Claims. (Cl. 309—3)

This invention relates to improvements in assemblies for securing and sealing liners within hollow bodies and refers more particularly to a novel assembly for securing a liner within a hollow open end body and for sealing between the liner and body and a closure cap and body at the open end of the body.

In securing liners within a hollow body, it has heretofore been necessary to provide separate means for tightening the sealing assemblies for providing a seal between the liner and body and the closure cap and the open end of the body. Various arrangements have been provided to accomplish this, but it has not heretofore been possible to tighten both the packing arrangements and secure the closure cap and liner by a single fastening means or by tightening a single series of studs or the like.

An object of this invention is to provide an improved liner assembly employing a single fastening means for securing the liner within a hollow body with an open end and sealing between the body and liner and the body and a closure cap for the open end of the body.

Another object is to provide a liner and cap assembly especially adaptable for use in a slush pump cylinder which may be operably secured relative to a slush pump cylinder by tightening a single series of studs or the like.

A further object is to provide in a slush pump a cylinder liner with a seal between the cylinder and the liner and a closure cap for the cylinder head of the pump with a connection between the liner and cap that will simultaneously hold the liner in place and provide seals between the liner and body and the cap and the body when the cap is secured to the cylinder head.

Still another object is to provide in a pump a liner hold-down and seal assembly wherein all of the tightening means for securing and sealing the liner within the pump are readily accessible exteriorly of the pump.

A still further object is to provide a liner packing and cylinder head packing for pumps with an arrangement for expanding both at the same time by tightening a single series of studs which may be adjusted from time to time in operation in order to keep both packings tight.

Yet another object is to provide a liner hold-down and seal assembly employing heavy rugged parts which may be readily made up many times tighter than in conventional assemblies.

Other and further objects of this invention will appear as the description proceeds.

In the accompanying drawings which form a part of the instant specification, are to be read in conjunction therewith, and wherein like reference numerals are used to indicate like parts in the various views:

Fig. 1 is a perspective view, with parts shown in section, embodying this invention and illustrating the main portion of a slush pump in phantom, and

Fig. 2 is a sectional view upon an enlarged scale illustrating a liner hold-down and seal assembly in accordance with this invention.

Referring to the drawings, the numeral 5 designates generally a slush pump shown chiefly in dotted lines in Fig. 1 having a pump cylinder 6 receiving a liner sleeve 7 in which a piston 8 is adapted to reciprocate. The pump has an inlet connection 9 and an outlet connection 10 through which fluid to be pumped has ingress and egress respectively to the interior of the sleeve.

By reference to Fig. 2, it will be seen that the sleeve 7 and cylinder body 6 have parts forming a variable capacity packing receiving space to seal between the pump body and sleeve. These parts include the opposing surfaces or shoulders 11 and 12 upon the sleeve and body respectively. Any suitable packing assembly may be carried within the space between the two shoulders, but it is preferred to employ a tattletale or telltale type packing made up of a spacer ring 13 having internal and external grooves connected by a plurality of passages, all of which communicate with a groove 14 formed in the pump body so that in the event of leakage past either of the expansible resilient packing rings 15 or 16, the leaking fluid will exit through passage 14 indicating a failure of the seal. It is usually desirable to employ packing expander rings 17 and 18 in the seal assembly, which may be crowned.

A cap 19 is secured across the cylinder head by a single fastening means, as a series of studs 20. These studs extend through an annular flange on the cap 19 and are anchored in the pump body. Between the cap and liner sleeve resides a liner hold-down and packing expander member 21 which abuts the liner sleeve, as at 22, to transmit force to the sleeve along its longitudinal axis in a direction to bring shoulders 11 and 12 closer together and thus tighten the packing therebetween.

Preferably the connection between the cap 19 and member 21 is such as to provide a seal between the cap and the pump body, and this may be accomplished by parts carried by the cap and member so as to provide a variable capacity packing receiving space. These parts include a substantially cylindrical extension 22*a* formed on the cap adapted to fit closely within the cylinder head opening and opposed abutment surfaces 23 and 24 carried respectively by the cap and hold-down member. While the shoulder 24 may telescope within the reduced diameter portion of extension 22*a*, it is preferable to employ a movable ring 25 for this purpose which abuts surface 24 and may be crowned to facilitate expansion of expansible resilient packing material 26. Ring 25 should be sufficiently heavy and rigid to resist distortion in use to prevent it from binding or sticking within the cylinder head. Of course, the member 21 is in the nature of a cage with a plurality of openings 21*a* which communicate between the interior of the liner sleeve and the discharge of the pump, the valve member 27 controlling this passage.

It is believed that the operation of this invention is apparent from the foregoing description. The cage member 21 provides a connection between the sleeve and cap capable of transmitting force to the liner sleeve to urge it along its longitudinal axis in a direction to reduce the capacity of the chamber between surfaces 11 and 12. This results in radial expansion of the packing elements 15 and 16 to seal between the liner sleeve and the body. Simultaneously with this, the packing element 26 is expanded radially to seal between the cap 19 and the pump body. Thus, the manipulation of the single series of studs or bolts 20 simultaneously provides the seal between the sleeve and the pump body and closure for the cylinder head and the pump body, and also provides a hold-down mechanism to retain the liner sleeve in position within the pump cylinder.

The construction is such that the packing assembly for sealing between the cap and pump body may be large enough to provide an adequate seal to withstand the large pressures usually encountered in slush pumps. The arrangement is such that all of the studs 20 are readily accessible from exteriorly of the device and the packing assemblies may be placed under very great pressure by the exertion of only a small amount of effort in the tightening of any particular stud because of the great number of studs that may be employed in this single series. The extension 22*a* has sufficient length that if, in operation, either of the packing materials 26 or 15 and 16 becomes worn, they may be tightened up by tightening the studs 20. The assembly may be easily removed to repair or replace a liner sleeve or any other part within the cylinder and all of the parts may be inexpensively fabricated of heavy rugged materials.

It is contemplated that the cage member 21 may be closed at its end remote from sleeve 7 and the packing assembly between the member and cap 19 arranged to seal between the member and body in which case the member actually serves as the closure for the cylinder

head, but in the interest of simplicity, the embodiment of the invention shown in the drawings is preferred.

From the foregoing it will be seen that this invention is one well adapted to attain all of the ends and objects hereinabove set forth, together with other advantages which are obvious and which are inherent to the structure.

It will be understood that certain features and subcombinations are of utility and may be employed without reference to other features and subcombinations. This is contemplated by and is within the scope of the claims.

As many possible embodiments may be made of the invention without departing from the scope thereof, it is to be understood that all matter herein set forth or shown in the accompanying drawings is to be interpreted as illustrative and not in a limiting sense.

The invention having been described, what is claimed is:

1. In a pump having a cylinder opening out onto a cylinder head, the combination which comprises a liner slidably received in said cylinder, said liner having an external shoulder opposing an internal shoulder in said cylinder, expansible resilient liner packing between said shoulders including a rigid crowned packing expander ring abutting one of said shoulders whereby the liner packing can be expanded against fluid flow by longitudinal movement of said liner into said cylinder, a cap releasably secured to said cylinder head and having an extension fitting closely into the open end of said cylinder, an annular part joined to the end of the extension and having an outer diameter less than the inner diameter of said cylinder to form an annular shoulder thereby on said extension, a second rigid packing expander ring having a sliding fit around said annular part and with the wall of said cylinder, said second ring having a crowned face opposing the shoulder on said extension, expansible resilient cap packing between said ring and extension shoulder having an endwise face formed to fit with said crowned face of said second ring, and a liner hold-down and packing expander member abutting one of its ends against said liner and its other against said second expander ring, said cap and member being free to move toward each other to expand the cap packing, whereby force applied to said cap to pull it toward said cylinder head will be transmitted to said member and liner solely through said cap packing so that said liner packing and cap packing can be expanded concomitantly.

2. A liner and hold-down assembly comprising a cylindrical annular liner having an outwardly extending shoulder facing away from one end of the liner, a rigid crowned packing expander ring abutting said liner shoulder, expansible resilient liner packing abutting said ring, a liner hold-down and expander member abutting one of its ends against said one end of said liner, a second packing expander ring abutting the other end of said member, a cap having a circular extension with a reduced diameter part, said part having a close sliding fit into said second ring and forming a cap shoulder on said extension opposing and movable with said cap toward said second ring, the latter having a crowned face opposite said cap shoulder, and expansible resilient packing between said cap shoulder and the crowned face of said second ring, said cap being free to move toward said liner and expand said cap and liner packings concomitantly, the force for expanding said liner packing being transmitted from said cap to said liner hold-down and expander member solely through the cap packing.

3. In a pump having a cylinder for a piston opening out onto a cylinder head, the combination which comprises an elongate annular liner slidably received in said cylinder, said liner having an external shoulder opposing an internal shoulder in said cylinder, expansible resilient liner packing between said shoulders whereby the liner packing can be expanded against fluid flow by longitudinal movement of said liner into said cylinder, a cap releasably secured to said cylinder head, a liner hold-down and packing expander member positioned between the liner and cap, one of said member and cap having an extension with a reduced diameter portion having a close sliding fit with a portion of the other of said member and cap and forming a shoulder on the extension confronting an endwise facing shoulder on the other of said member and cap, expansible resilient cap packing between said confronting shoulders, said cap and member free to move toward each other to expand the cap packing and form a seal between the cap and member, whereby force applied to said cap to pull it toward said cylinder head to maintain said liner in said cylinder will be transmitted to said hold-down and expander member and to said liner solely through said cap packing so that said liner packing and cap packing can be expanded concomitantly.

4. A liner and hold-down assembly comprising an elongate cylindrical annular liner having an outwardly extending shoulder facing away from one end of the liner, expansible resilient liner packing adjacent said liner shoulder, a liner hold-down and expander member abutting one of its ends against said one end of said liner, a cap, one of said member and cap having a circular extension with a reduced diameter part, said part having a close sliding fit into a portion of the other of said member and cap and forming a shoulder on the extension confronting an endwise shoulder on the other of said member and cap, and resilient cap packing between said confronting shoulders, said shoulder on said cap movable with the cap toward the shoulder of the member to expand the cap and liner packings concomitantly, the force for expanding said liner packing and for maintaining said liner in position being transmitted from said cap to said liner hold-down and expander member solely through the cap packing.

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