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HYDRAULIC CYLINDER ROD SEAL MECHANISM

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FIG. 1.

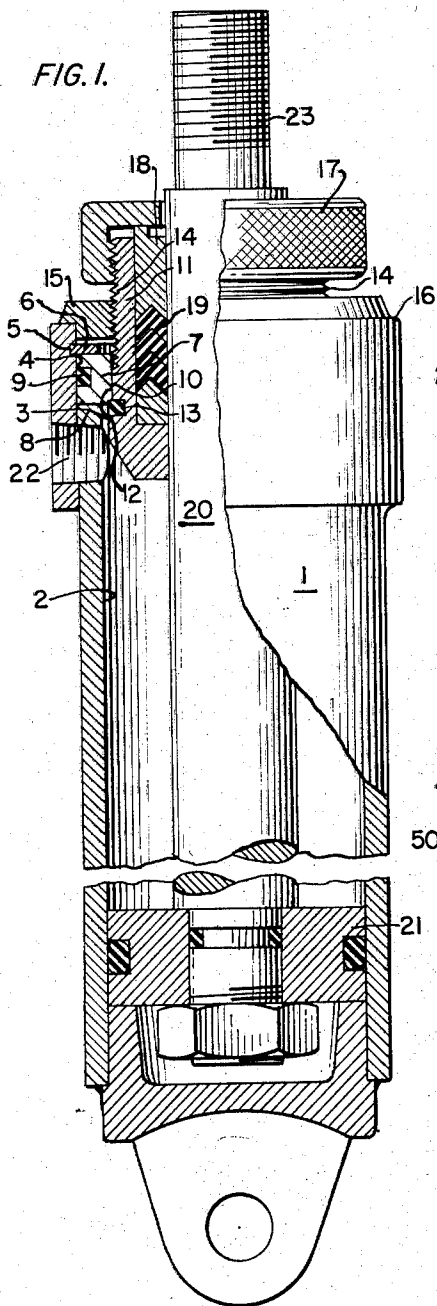


FIG. 2.

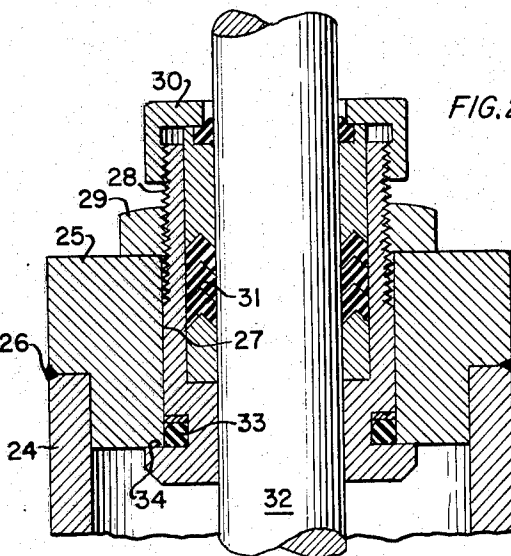
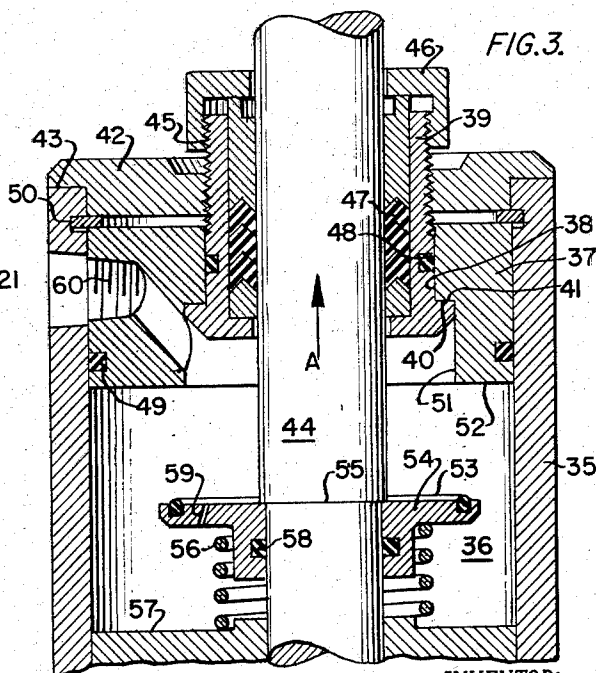


FIG. 3.



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HYDRAULIC CYLINDER ROD SEAL MECHANISM

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4 Claims. (Cl. 286—12)

This invention relates to a hydraulic cylinder rod seal mechanism.

Hydraulic cylinders are normally employed to actuate various mechanisms, and are particularly powerful, in proportion to their size, due to high operating pressures of fluid employed to drive the plunger in such cylinders. In double acting cylinders fluid pressure may alternately be imposed on either end of a cylinder plunger, in which case the rod packing gland in one end of the cylinder is subjected to full pressure of the operating fluid. High pressure hydraulic cylinder rod seals are concurrently subjected to fluid pressure and rubbing of the cylinder rod therethrough.

Heretofore, high pressure hydraulic cylinder rod seal mechanisms have been expensive to produce and maintain and also difficult to produce in standard sizes which may be used in a variety of cylinders.

According to the present invention a hydraulic cylinder rod sealing mechanism is so arranged that it may be made in a standard size to fit a variety of hydraulic cylinders of varying capacity and power output.

The invention also provides structure in which a common thread on a rod sealing gland serves to engage a cylinder end fixing nut and also a gland adjusting nut, whereby simplicity and economy of manufacture is permitted. Such structure also simplifies maintenance and general overhaul operations on such hydraulic cylinders.

The novel structure of the invention also provides for economical replacement of worn rod sealing glands in the end structures of hydraulic cylinders.

It is an object of the invention to provide a hydraulic cylinder rod sealing mechanism which may be manufactured in a standard size for various cylinders and which may be readily installed therein by providing a cylinder end bushing of the proper external diameter.

Another object of the invention is to provide a hydraulic cylinder rod seal mechanism wherein a packing gland is provided with a shoulder adapted to engage the inner end of a bushing within a cylinder and is also provided with an externally screw-threaded portion arranged to engage a cylinder end bearing nut and also arranged to screw-threadably engage a packing adjusting nut whereby simplification of the rod seal mechanism is provided.

Another object of the invention is to provide a hydraulic cylinder rod seal mechanism of this class which is very simple to manufacture and easy to maintain.

Another object of the invention is to provide a hydraulic cylinder rod seal mechanism which is very compact, durable, and which employs novel means for sealing itself relative to a bushing in which it is located and within the hydraulic cylinder supporting the bushing.

A further object of the invention is to provide a novel and very useful hydraulic cylinder rod seal mechanism.

These and other objects will be apparent from the following specification, appended claims, and the accompanying drawing in which:

Fig. 1 is a longitudinal sectional view of a hydraulic cylinder having the hydraulic cylinder rod seal mechanism

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therein in accordance with the present invention and showing parts and portions in elevation to facilitate the illustration;

Fig. 2 is a fragmentary longitudinal sectional view of a hydraulic cylinder showing a modified form of the hydraulic cylinder rod seal mechanism in accordance with the present invention; and

Fig. 3 is another longitudinal sectional view of a hydraulic cylinder showing a further modified form of the hydraulic cylinder rod seal mechanism in accordance with the present invention.

With reference to Fig. 1 of the drawings it will be seen that a hydraulic cylinder 1 is provided with a piston receiving bore 2 having an open end 3 communicating with an enlarged bore portion 4 which is provided with a retaining ring groove 5 wherein a retaining ring 6 is positioned. The retaining ring 6 engages one side of a bushing 7 which is abutted to a shoulder 8 which forms a transition between the bores 2 and 4, hereinbefore described.

The bushing 7 is provided with a sealing member 9 having O-ring sealing member therein. The bushing 7 is provided with a bore 10 in which the packing gland 11 is positioned. This packing gland 11 is provided with a shoulder 12 which abuts the bushing 7 in opposed relation to the snap ring 6. The packing gland 11 is provided with a groove 13 having an O-ring sealing member therein which engages the bushing 7 to provide a seal intermediate the packing gland 11 and the bushing 7, it being noted that the seal member 9 provide a hydraulic seal between the bushing 7 and the enlarged bore 4 of the hydraulic cylinder 1.

The packing gland 11 is provided with external screw-threads 14 which are engaged by a nut 15 which is tightened against the end 16 of the hydraulic cylinder 1 whereby the shoulder 12 of the packing gland 11 is forced against the bushing 7 which in turn is securely engaged with the snap ring 6 in the groove 5, hereinbefore described.

Also engaging the same threads 14 of the packing gland 11 is a nut 17 which bears upon an annular packing ring 18 which in turn bears against sealing rings 19 which engage and surround the rod 20 of the hydraulic cylinder 1. This rod 20 is connected to a conventional hydraulic cylinder piston 21.

An internally screw-threaded port 22 in the side wall of the hydraulic cylinder 1 is arranged to conduct hydraulic fluid under pressure into the bore 2 of the hydraulic cylinder 1 in order to exert force on the piston 21. This same hydraulic fluid pressure surrounds the shaft 20 and is sealed within the cylinder 1 by means of the O-ring seals in the grooves 9 and 13 and also by the packing rings 19 surrounding the rod 20. The outer end 23 of the rod 20 is externally screw-threaded and thereby arranged to be connected with mechanism to be actuated, as desired.

It will be understood that the packing gland member 11 may be made in a standard size to fit a standard rod while the bushing 7 is provided with a confining bore 10 to receive the packing gland member 11. It will be noted, however, that the external diameter of the bushing 7 may vary in order to accommodate hydraulic cylinders of varying internal diameter. This provides for standardization of manufacture and stocking of parts which are replaceable due to wear resulting from operation of such hydraulic cylinders. A great advantage of this structure might be found in military applications where a standard packing gland could be used for a great variety of hydraulic cylinders. The simple shouldered arrangement of the packing gland member 11 with the bushing 7 which is abutted to the snap ring 6 provides

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an economical and positive mechanism which is easily produced, assembled and maintained.

Another novel arrangement of the rod seal mechanism is the use of the same thread 14 for engagement with the nut 15 and the packing adjustment nut 17. While the nut 15 is tightened against the end 16 of the cylinder 1, it forces the shoulder 12 of the packing gland member 11 against the bushing 7 which in turn is abutted against the snap ring 6 thereby providing a very secure assembled arrangement of the cylinder end structure and rod sealing mechanism.

In the modified structure as shown in Fig. 2 of the drawings a cylinder 24 corresponds to the cylinder 1, shown in Fig. 1 of the drawings, and a bushing 25 corresponds to the bushing 7, shown in Fig. 1 of the drawings. It will be seen that the bushing 25 is welded at 26 to the end of the cylinder 24 and provides a very rugged end structure which may resist considerable wear and abuse.

The bushing 25 is provided with a bore 27 corresponding to the bore 10 of the hereinbefore described bushing 7. It will be seen that a packing gland member 28 is similar in construction to the hereinbefore described packing gland 11 and nuts 29 and 30 correspond to the nuts 15 and 17, shown in Fig. 1 of the drawings.

The packing gland member 28 is provided with internal sealing rings 31 which engage a rod 32 corresponding to the rod 20 of structure hereinbefore described.

A sealing ring 33 in the packing gland member 28 engages the bore 27 of the bushing 25 while a shoulder portion 34 of the packing gland member 28 engages the inner end of the bushing 25. It will therefore be understood that the packing gland structure shown in Fig. 2 is similar to that shown in Fig. 1 and these gland structures may be readily interchangeable while the construction of the hydraulic cylinder relative to the bushing or end member may be slightly different. For example, as hereinbefore described, the bushing 25 is welded at 26 to the cylinder 24 while the bushing 7, shown in Fig. 1 of the drawings, is retained in the end of the cylinder 1 by means of the snap ring 6.

In the modification as shown in Fig. 3 of the drawings a cylinder 35 having a bore 36 contains a bushing 37 which is provided with a bore 38 adapted to receive a packing gland member 39 similar to the hereinbefore described glands 11 and 28. This gland 39 is provided with a shoulder portion 40 which abuts a shoulder 41 within the bore 38 of the bushing 37 while an end member 42 engaging the end 43 of the cylinder 35 is externally screw-threaded on the packing gland member 39. It will be understood that due to the eccentricity of the end member 42 relative to the axis of the rod 44 and the external threads 45 of the packing gland member 39 that the packing gland member 39 must be tightened by rotation thereof relative to the end member 42. Such rotation and tightening operations may be accomplished by a spanner wrench, or the like. A nut 46 is arranged to adjust sealing elements 47 internally of the packing gland 39 around the rod 44. Sealing rings 48 and 49 seal the packing gland relative to the bushing 37 and the bushing 37 relative to the bore 36 of the cylinder 35, respectively. It will be seen that a snap ring 50 retains the bushing 37 in the cylinder 35 in opposition to clamping force exerted by tightening the screw-threaded relationship of the packing gland 39 and the end member 42, as hereinbefore described.

The bushing 37 is provided with an enlarged bore portion 51 in which the shoulder 40 of the packing gland 39 is positioned. The inner end 52 of the bushing 37 is engageable by a sealing member 53 carried by a cushioning means 54 which is positioned on the rod 34 in abutted relationship to a shoulder 55 thereon. A spring 56 engaging the piston 57 tends to hold the cushioning means 54 in engagement with said shoulder 55. An internal sealing ring 58 carried by the cushioning means 54 pro-

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vides a seal intermediate the rod 34 and cushioning means 54.

An orifice 59 extends through the cushioning means 54 inwardly of the sealing ring 53 to provide a restricted fluid flow passage from the interior of the cylinder and outwardly through a port 60 when the sealing member 35 is engaged with the end 52 of the bushing 37 and when the piston 57 is moving in the direction as indicated by the arrow A in Fig. 3 of the drawing. This arrangement provides for a hydraulic cushion at the end of the stroke of the piston 47 when moving in the direction of the arrow A.

From the foregoing description of the invention and various hydraulic cylinders in which it may be used, it will be understood that a packing gland structure for a hydraulic cylinder rod seal mechanism according to the present invention may be standardized upon, if desired, whereby numerous types of hydraulic cylinders may be serviced and overhauled by employing the same, or similar, gland assembly which is the most commonly replaced part during overhaul of hydraulic cylinders.

Having thus described the invention and present embodiments thereof it is desired to emphasize the fact that many further modifications may be resorted to in a manner limited only by a just interpretation of the following claims.

I claim:

1. In a hydraulic cylinder rod seal mechanism, a cylinder, a bushing removably retained in one end of said cylinder, a packing gland removably positioned in said bushing, sealing means in said gland, a rod extending therethrough, second and third sealing means arranged to seal said bushing relative to said cylinder and to seal said packing gland relative to said bushing, said packing gland being provided with a shoulder having engagement with said bushing and a nut screw-threaded on said packing gland and abutted by said cylinder in opposition to said shoulder.

2. In a hydraulic cylinder rod seal mechanism, a cylinder, a bushing removably retained in one end of said cylinder, a packing gland provided with a shoulder and removably positioned in said bushing, first sealing means in said gland, a rod extending therethrough, second and third sealing means arranged to seal said bushing relative to said cylinder and to seal said packing gland relative to said bushing, a nut screw-threaded on said packing gland and abutted by said cylinder in opposition to said shoulder and a second nut screw threaded on said packing gland for adjusting said first sealing means.

3. In a hydraulic cylinder rod seal mechanism, a cylinder having a bore therethrough, a bushing having a bore and removably retained in the bore of said cylinder, a packing gland removably positioned in the bore of said bushing, sealing means in said gland, a rod extending therethrough, O-ring sealing means arranged to seal said bushing relative to said cylinder and to seal said packing gland relative to said bushing, said packing gland having a shoulder engaging said bushing and a nut screw-threaded on said packing gland and abutted by said cylinder in opposition to said shoulder and a second nut screw-threaded on said packing gland and engaging the end of said first mentioned sealing means.

4. In a hydraulic cylinder rod seal mechanism, a cylinder having a bore therethrough, a bushing having a bore and removably retained in the bore of said cylinder, a packing gland removably positioned in the bore of said bushing, sealing means in said gland, a rod extending therethrough, resilient sealing means arranged to seal said bushing relative to said cylinder and to seal said packing gland relative to said bushing, said packing gland having a shoulder engaging said bushing, a nut screw-threaded on said packing gland and abutted by said cylinder in opposition to said shoulder, a second nut screw-threaded on said packing gland and engaging the end of said first mentioned sealing means and a snap ring in said cylinder

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for retaining said bushing therein in opposed relation
to said last mentioned nut in its engagement with the
end of said cylinder.

References Cited in the file of this patent

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UNITED STATES PATENTS

584,592	Johnson	June 15, 1897	27,700
2,299,695	Greene	Oct. 20, 1942	219,463

2,451,089
2,556,698
2,673,130
2,719,766
2,757,993

6

Hunter	Oct. 12, 1948
Loewe	June 12, 1951
Becker	Mar. 23, 1954
Densmore	Oct. 4, 1955
Flick	Aug. 7, 1956

FOREIGN PATENTS

Great Britain	of 1902
Great Britain	July 31, 1924