FIG. 1

FIG. 2

FIG. 3

FIG. 4

FIG. 5

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The present invention relates to an end cap mounting for cylinders and especially to a novel means and method of holding an end cap or head to a cylinder and sealing this end cap or head and cylinder against leakage. The novel embodiment comprehends retaining and sealing the head or end cap to the cylinder by dividing the holding action and the sealing action into separate components, with the sealing action obtained by means of a flexible or resilient packing ring mounted and operating in a groove in the head or end cap in such manner that this packing ring is held under compression between the inside diameter of the cylinder and the groove in the head or end cap.

In the usual manner of tightening a head or end cap to the end of a cylinder, sealing action is accomplished between the surfaces being tightened by applying pressure between these surfaces to prevent leakage. Any relaxing of this pressure or any strain in the operation has a tendency to cause a leak. In the present novel embodiment any appreciable relative movement of the head or end cap with respect to the cylinder would have no effect upon the sealing action, and it is only necessary that the holding clamp exert sufficient pressure to hold the head or end cap to the end of the cylinder.

Further objects are to provide a construction of maximum simplicity, efficiency, economy and ease of assembly and operation, and such further objects, advantages and capabilities as will later more fully appear and are inherently possessed thereby.

The invention further resides in the construction, combination and arrangement of parts illustrated in the accompanying drawing, and while there is shown therein a preferred embodiment, it is to be understood that the same is susceptible of modification and change, and comprehends other details, arrangements of parts, features and constructions without departing from the spirit of the invention.

In the drawings:

Figure 1 is a view in side elevation of an hydraulic actuating cylinder assembly embodying the novel invention.

Figure 2 is an end view of the assembly.

Figure 3 is a view in horizontal cross section through the actuating cylinder to more clearly show the relation of the clamping and sealing means.

Figure 4 is an enlarged view in vertical cross section of that portion of Figure 3 showing the relationship of the sealing element to the groove in which it seats.

Figure 5 is a fragmentary enlarged view in vertical cross section through the clamping sections and connecting screw taken on the line 4—5 of Figure 3 and viewed in the direction of the arrow.

Referring more particularly to the disclosure in the drawing, the hydraulic actuating cylinder assembly comprises a cylinder 1 having an end cap or head 2 at one end provided with a passage 3 for hydraulic fluid and a housing 4 at the other end also provided with a passage 5 for the fluid. The end cap or head 2 and the housing 4 are each adapted to be retained upon its respective end of the cylinder by means of a sectional clamp 6. Each arcuate section 7 of the clamp is provided with a complementary offset or shoulder portion 8 having aligned openings therethrough, one of which is internally threaded to receive a screw, bolt or the like 9. In order to prevent accidental removal, each screw or bolt is provided with an opening adjacent its lower end for receiving a locking wire 10.

The clamping sections 7 are channeled at 11 with the opposite sides of the channel tapering outwardly for receiving and clampingly engaging complementary tapered surfaces provided on the opposite faces of the mating flanges 12 and 13 on the cylinder 1 and head or end cap 2, respectively. By reason of this construction and arrangement, when the clamp sections 7 are placed over the flanges and drawn together by means of the screws 9, a pulling up and clamping action is obtained so as to lock these parts together.

In order to effectively seal the end cap or head 2 and housing 4 to the cylinder, the invention comprehends forming their inwardly projecting ends 14 and 15 with an external groove or recess 16 of substantially V-shape, with the opposite sides 17 and 18 disposed at an angle of approximately 60° and with the base of this groove or recess rounded. Within this groove or recess is placed a resilient or flexible sealing element 19 preferably formed of a natural or compounded synthetic rubber. This sealing element or packing ring is shown as of substantially wedge-shape with its opposite sides 20 and 21 disposed at an angle of approximately 45° so that the angle of the groove in which it operates is greater than the angle of its side walls to permit this sealing element or packing to slip or pivot from one side of the V-shaped groove to the other. This pivoting takes place about its vertex 22 which has a
radius of curvature preferably somewhat less than but approximately conforming to the radius of curvature of the bottom of the V-shaped groove 16. The sealing face 25 of the packing is curved and normally extends beyond the adjacent circumference of the inwardly projecting ends 14 and 15 so that this sealing element or packing ring is held under compression between the inside diameter of the cylinder and the groove in the head or housing when the parts are assembled. The packing ring is also rounded at its corners to prevent these corners from being extruded between the corners 24 and the adjacent interior surfaces of the cylinder.

From the above description it will be apparent that the sealing action and the clamping or holding action are so related that the head 2 or housing 4 could actually move in or out an appreciable amount without in any way effecting the sealing action, and by reason of this novel arrangement, it is only necessary that the holding clamp exert sufficient pressure to firmly hold the head and housing to the end of the cylinder. The sealing action will maintain regardless of the degree of pressure exerted by the clamps.

Having thus disclosed the invention, I claim:

1. Means for clamping a head upon an hydraulic actuating cylinder and for sealing the head and cylinder independent of the degree of pressure exerted by the clamping means, comprising cooperating flanges on the head and cylinder provided with abutting mating faces, clamping members channeled to encompass the flanges and clampingly lock the flanges and their respective head and cylinder in assembled relation, a reduced part on the head forming a cylindrical surface adapted to project into and slidably contact the inner wall of the cylinder, and sealing means including a substantially V-shaped peripheral groove in the cylindrical surface and a substantially wedge-shaped resilient sealing element pivotally mounted in the groove and having a rounded contacting face extending beyond the groove for engagement with the interior of the cylinder, the cross-section of the sealing element being less than the width of the groove whereby its sides are normally spaced from the sides of the groove to permit the sealing element to pivot during operation and assembly of the head upon the cylinder.

2. Means for connecting and sealing a pair of members such as an end cap and cylinder, comprising flanges on the end cap and cylinder having mating faces, a clamp adapted to encompass the flanges to retract and lock these flanges together, encompassing and cooperating parts on the end cap and cylinder, and including a cylindrical portion on the end cap adapted to project into and slidably contact the inner wall of the cylinder, a substantially V-shaped and outwardly opening peripheral recess provided in the projecting cylindrical portion and a resilient, rubber-like packing in the recess of substantially wedge-shape having straight, angularly arranged sides normally spaced from the sides of the recess, a rounded vertex about which the packing pivots, and a rounded sealing surface projecting beyond the depth of the recess for sealing contact with the interior of the cylinder.

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