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PRESSURE BIASED ACTUATOR ROD FOR HYDRAULIC
PISTON AND CYLINDER ASSEMBLIES
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PRESSURE BIASED ACTUATOR ROD FOR HYDRAULIC PISTON AND CYLINDER ASSEMBLIES

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This invention relates to means for conveying motion of a piston within a cylinder to the exterior of the cylinder so that such motion may be utilized in operating a circuit controlling device.

The principal object of the invention is the provision of an automatic circuit control actuator for a piston and cylinder device.

A further object of the invention is the provision of a simple and inexpensive circuit control actuator comprising a pressure biased actuator rod extending through a wall of a cylinder.

A still further object of the invention is the provision of an automatic circuit control actuator arranged to operate on the differential in pressure on a pressure biased actuator rod to cause the same to move into a cylinder against pressure fluid therein.

A still further object of the invention is the provision of a pressure biased actuator rod extending through a wall of a hydraulic piston and cylinder device and incorporating close mating parts with appropriate seals to prevent hydraulic block.

The automatic circuit control actuator disclosed herein comprises a pressure biased actuator rod positioned through the head of a hydraulic cylinder in movable liquid-tight relation in a chamber formed in the head of the cylinder and communicating with the cylinder itself. A piston-like enlargement on the actuator rod provides a larger area than the area of the rod extending into the cylinder itself so that the same pressure fluid in the cylinder will bias the pressure actuated rod into the cylinder and hold it in such position until it is moved by the engagement of the piston in the cylinder thereagainst. The outer end of the rod extends through a suitable gland and provides motion for actuating a circuit controlling switch or the like as will occur to those skilled in the art.

With the foregoing and other objects in view which will appear as the description proceeds, the invention resides in the combination and arrangement of parts and in the details of construction hereinafter described and claimed, it being the intention to cover all changes and modifications of the example of the invention herein chosen for purposes of the disclosure, which do not constitute departures from the function and scope of the invention.

The invention is illustrated in the accompanying drawing, wherein:

Figure 1 is a cross sectional elevation of the pressure biased actuator rod in a piston and cylinder device.

Figure 2 is a cross sectional elevation of the pressure biased actuator rod in the piston and cylinder assembly with parts broken away and illustrating the movement of the rod by the piston of the piston and cylinder assembly.

By referring to the drawings and Figure 1 in particular, it will be seen that a cylinder 10 of a hydraulic piston and cylinder device is disclosed and provided with a head 11 forming a closure for the end of the cylinder illustrated. A piston 12 is reciprocally positioned in the cylinder 10 and is secured to a piston rod 13. The head

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11 of the cylinder 10 has a bore forming a cylindrical chamber 14 therein, the innermost portion of which has smooth walls and the outermost portion of which has a thread pattern 15 formed therein. A secondary passageway extends from the low pressure side of the cylindrical chamber 14 through the head 11 to vent the same. A longitudinal axial extension of the cylindrical chamber 14 is indicated by the numeral 16 and communicates with the interior of the cylinder 10.

An exteriorly threaded plug 17 having an axially extending passageway therethrough is engaged in the thread pattern 15 and against a gasket 18 positioned in the head 11 about the opening in which the threaded plug 17 is positioned. An actuator spool or rod 19 of a length sufficient to extend completely through the head 11 is mounted for longitudinal reciprocal movement in the passageway within the threaded plug 17 and has an enlargement or piston 20 secured thereto in the area thereof within the cylindrical chamber 14.

An annular groove in the periphery of the piston 20 mounts sealing means comprising an O-ring 21 thereabout to effect a seal between the piston 20 and the cylindrical chamber 14 and the actuator rod 19 has a pair of annular grooves thereabout in oppositely disposed spaced relation to the piston 20 mounting sealing means comprising O-rings 22 and 23, respectively, engaged in the axial extension of the cylindrical chamber 14 adjacent the cylinder 10 and within the axial passageway in the threaded plug 17. Said actuator rod thus has a stem portion at one end and an actuating portion at the other end with the stem portion exposed to pressure fluid in said cylinder 10.

The head 11 has a cavity 24 therein with a chamber 25 forming an extension thereof. A transverse passageway 26 establishes communication between the chamber 25 and the cylindrical chamber 14. A secondary passageway 27 communicates with the cavity 24, the chamber 25 and the exterior of the head 11 and forms a port by means of which pressure fluid communicates with the interior of the cylinder 10.

Assuming that pressure fluid is applied to the construction disclosed in Figure 1 of the drawings, as by way of the passageway 27, the actuator rod 19 will move to the position illustrated by reason of the greater area of the piston 20 within the cylindrical chamber 14 than the area of the stem end of the rod exposed within the cylinder 10.

At such time as the piston 12 travels to the end of the cylinder 10, closed by the head 11, it will engage and move the stem end of the actuator rod 19 to the position shown in Figure 2 of the drawings. The actuator or outer end of the actuator rod 19 will thus move outwardly of the head of the piston 11 and actuate circuit controlling means such as a limit switch or the like, as desired.

In Figures 1 and 2 of the drawings a circuit controlling electrical switch such as a limit switch 28 is illustrated having a switch actuating shaft 29 and a pivoted arm 30 in engagement therewith and arranged so that the end of the actuator rod 19 will engage the end of the arm 30 and move the same to actuate the switch 28.

At such time as pressure fluid is developed within the end of the cylinder 10 adjacent the head 11, as may be introduced therinto through the passageway 27, the differential in pressure against the piston 20 in the cylindrical chamber 14 as compared with the same pressure against the end of the actuator rod 19 within the cylinder 10 will cause the actuator rod 19 to move into the cylinder 10 to the position shown in Figure 1 of the drawings.

The cycle thus described will automatically repeat with each stroke of the piston 12 in the cylinder 10 and the

automatic and positive movement of the actuator rod 19 will provide an accurate and dependable point of control.

It will occur to those skilled in the art that the automatic circuit control actuator disclosed herein may be incorporated in the heads of hydraulic piston and cylinder assemblies to provide for the automatic actuation of control switches and the like.

It will thus be seen that the several objects of the invention have been met by the pressure biased actuator rod for hydraulic piston and cylinder assemblies described herein.

Having thus described my invention, what I claim is:

1. In a hydraulic position and cylinder assembly including a cylinder having at least one head thereon and a piston reciprocally mounted in said cylinder, and means for introducing fluid pressure into said cylinder for moving said piston away from said head, a cylindrical chamber in said head communicating with the exterior thereof at one end and with said cylinder at its other end, an actuator rod having a secondary piston thereon positioned for axial movement in said cylindrical chamber, sealing means engaged in said cylindrical chamber adjacent the exterior of said head and around said actuator rod, a passageway in said head establishing communication between said cylinder and said cylindrical chamber at a point between said secondary piston and said sealing means, one end of said actuator rod extending beyond said secondary piston and into said cylinder, and the other end of said actuator rod extending in oppositely disposed relation from said secondary piston through said sealing means and head and exteriorly thereof, and a switch positioned in axial alignment with said actuator rod for actuation thereby.

2. The improvement in piston and cylinder assemblies as set forth in claim 1 and wherein the diameter of the actuator rod is uniform throughout its length and the diameter of said secondary piston secured thereto inwardly of the ends thereof is substantially larger than the said diameter of the actuator rod.

3. A hydraulic piston and cylinder assembly having means for actuating a circuit control switch exteriorly of said piston and cylinder assembly, said piston and cylinder assembly including a cylinder having a piston reciprocally mounted therein and a head closing an end of said cylinder, and means for introducing fluid pressure into said cylinder adjacent said head, said head having an opening formed therethrough in endwise relation to said cylinder, said opening being of one diameter inwardly from the exterior of said head and of a relatively smaller diameter inwardly from its point of communication with said cylinder, an intermediate portion of said opening forming a cylindrical chamber, a thread pattern formed in said head about said cylindrical opening adjacent the

exterior of said head, a threaded plug having an axial passageway therethrough engaged in said thread pattern in said head, the inner end of said plug defining one end of said cylindrical chamber, a rod positioned through said axial passageway in said plug and through said opening and extending into said cylinder for engagement with said piston, the other end of said rod extending outwardly of said threaded plug to a position adjacent said circuit control switch and arranged to actuate the same when moved, a secondary piston attached to said rod intermediate its ends and disposed in said cylindrical chamber for reciprocal movement between the inner end of said threaded plug and the relatively smaller portion of said opening and a passageway in said head communicating with said cylinder and with said cylindrical chamber between said secondary piston and said plug whereby fluid pressure within said cylinder and between said piston and said head communicates with said cylindrical chamber and moves said secondary piston and rod toward said cylinder and piston.

4. A limit switch actuator for a piston and cylinder device, comprising: an actuator spool adapted to be slidingly mounted in a bore in a head of the cylinder, said actuator spool having a stem portion at one end and an actuating portion at the other end, said stem portion being exposed to pressure fluid within the cylinder and being positioned to be contacted by the piston, said actuating portion being slidable with the spool for operating the switch when the piston contacts the stem portion; an enlargement carried by the spool in a position adjacent the exposed end of the stem, said enlargement being of a size to afford a chamber in the bore on the side of the enlargement remote from the piston; sealing means for preventing application of cylinder pressure fluid to the enlargement on the stem side thereof; and means for introducing pressure fluid from the cylinder to the chamber side of the enlargement so as to oppose the cylinder pressure fluid on said exposed stem portion and to yieldingly urge the stem portion into position to be contacted by the piston.

References Cited in the file of this patent

UNITED STATES PATENTS

45	899,795	Osmer	Sept. 29, 1908
	2,008,013	Foster	July 16, 1935
	2,113,161	Osborne	Apr. 5, 1938
	2,537,680	Kupiec et al.	Jan. 9, 1951
50	2,755,966	Lindars	July 24, 1956

FOREIGN PATENTS

	610,945	Great Britain	Oct. 22, 1948
	265,267	Switzerland	Mar. 1, 1950