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[54] FLUID-ACTUATED CYLINDER ASSEMBLAGE

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[52] **U.S. Cl.**.....**92/128,** 92/255

[51] **Int. Cl.**.....**F01b 29/00,** F16j 1/00

[58] **Field of Search**.....92/128, 109, 255, 220, 145; 91/54

[56] **References Cited**

UNITED STATES PATENTS

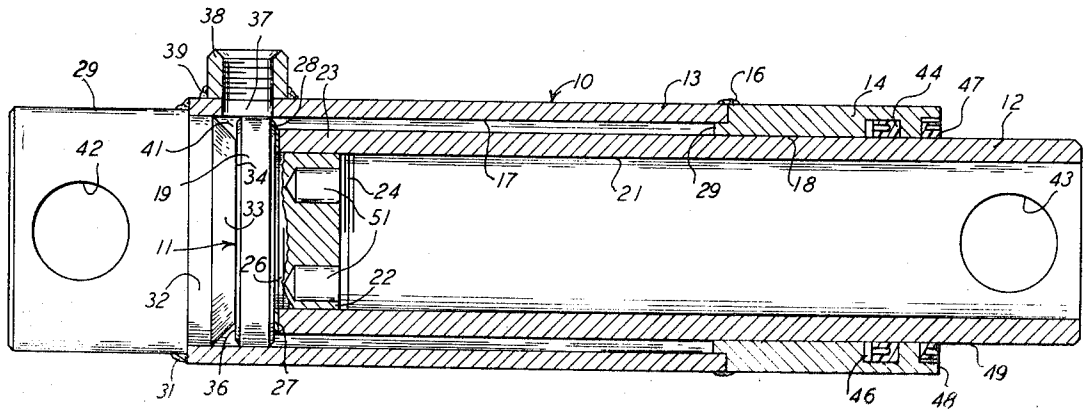
695,492	3/1902	Robertson	92/128
2,647,809	8/1953	Schindler	92/128
2,661,721	12/1953	Sherwen	92/255
2,853,347	9/1958	Cooper, Jr.	92/128
2,987,046	6/1961	Atherton	92/128
2,997,026	8/1961	Zimmerer	92/128
3,295,422	1/1967	Bostwick	92/128

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[57] **ABSTRACT**

A fluid-actuated cylinder assemblage of a type which can be readily serviced or repaired, even in the field. A cylinder has an end cap and a piston and rod are slidable within the cylinder. The piston and rod can be threaded into assembly, and the rod is hollow so that a work tool can extend into the rod and engage the piston for controlling the piston in the screwing action between the rod and the piston for assembly and disassembly thereof. A fluid seal and a rod wiper exist between the cylinder and the rod and the seal is spaced inwardly from the end of the cylinder but is accessible for replacement when the rod is unscrewed relative to the piston and is removed from the cylinder. Also, the end cap and a fluid port and the piston itself are all arranged so that fluid can enter the cylinder to provide a working force on the piston, even when the piston is in its end limit position abutting a wall or face presented on the end cap.

7 Claims, 3 Drawing Figures



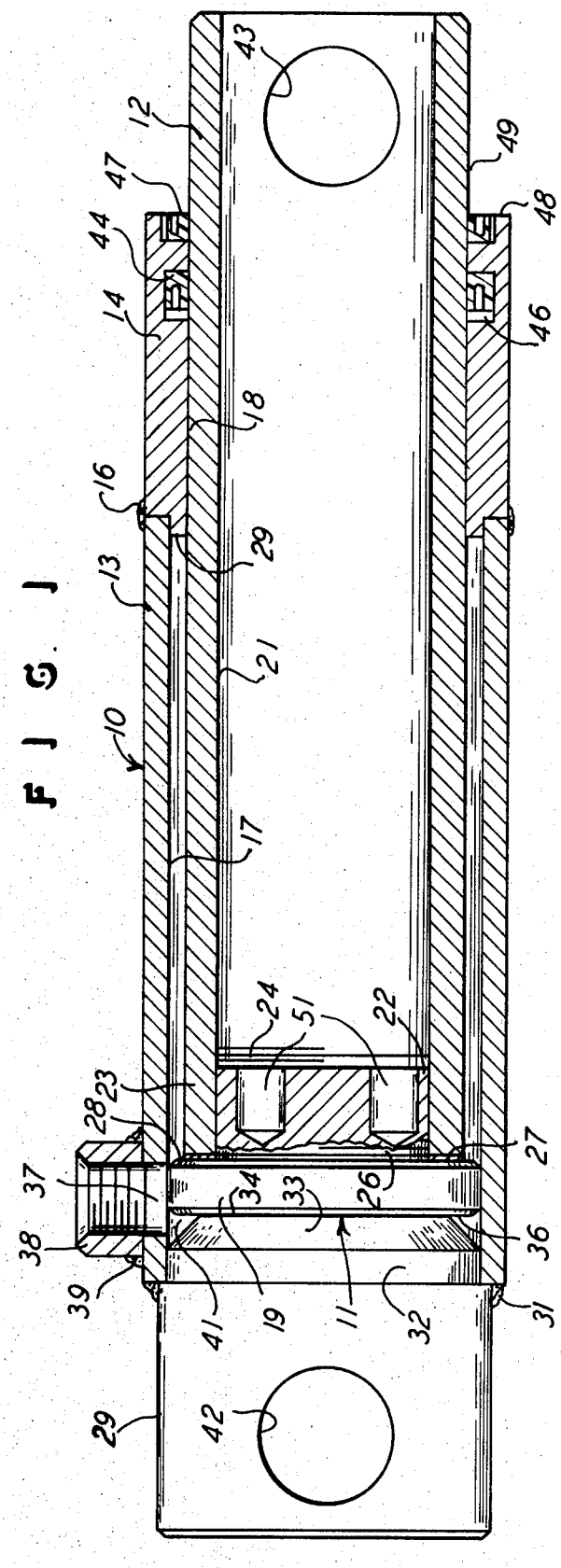


FIG. 1

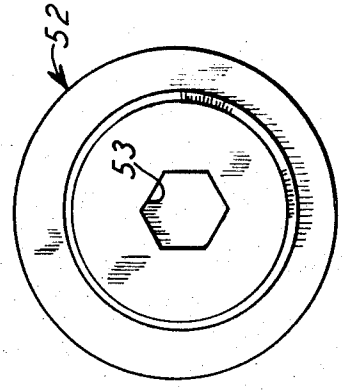


FIG. 3

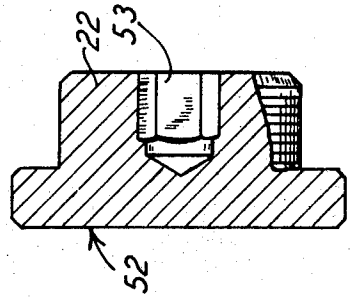


FIG. 2

FLUID-ACTUATED CYLINDER ASSEMBLAGE

This invention relates to a fluid-actuated cylinder assemblage, and, more particularly, it relates to a power cylinder which is specially provided for relatively light-duty service but which is readily servicable, even in the field.

BACKGROUND OF THE INVENTION

Fluid-actuated cylinder assemblages are well-known in many different forms. These cylinders may be powered by pneumatic pressure or hydraulic pressure, and they may be a single or double-acting type units. The design of these units is concerned with providing a fluid-tight, sturdy, efficient, and compact and easy-acting units. Of further concern in the design of these units, and of particular concern in the design of the unit disclosed herein, is the problem of assembling and servicing the units which are fluid-tightly sealed for efficient operation. For the most part, these units must be manufactured in a complex and intricate manner for both the purpose of original assembly, particularly relative to the assembly of the piston with the piston rod, and they must also be manufactured for the purpose of easy servicing. Examples of certain prior art patents are found in U.S. Pat. Nos. 2,987,046 and 3,065,734 and 3,486,419. These prior art examples do not fully concern themselves with the problems involved in the present invention, and they also do not suggest any teachings which would result in solutions to the problems of concern herein.

Accordingly, it is a primary object of this invention to provide a fluid-actuated cylinder assemblage which can be readily and easily manufactured and assembled, and which can be readily and easily serviced, even in the field.

Still further, it is an object of the present invention to provide a fluid-actuated cylinder assemblage which has the aforementioned attributes and which can be made in a compact and virtually minimum size. These objectives are accomplished with a minimum of parts and with a simplicity of structure, and this also lends to the feature of servicing in the field.

Still another object is to provide the assemblage of the nature mentioned, and to have it achieve the aforementioned objectives, and to do so with a unit which, while it is compact and sturdy and of a minimum number of parts, it is also arranged so that it will always respond to the introduction of fluid pressure into the cylinder. That is, the unit will not block or otherwise obstruct the action of the working fluid, even when the piston is in the inward end of its stroke and even though the unit may be a single-acting type.

Still further, it is an object of this invention to provide a fluid-actuated cylinder assemblage which can be readily assembled and disassembled, both in the manufacture of the assemblage and in the service thereof, but the unit does not damage itself by scoring in the action between the parts thereof, and it does not unduly force upon the parts relative to each other. In this particular regard, this invention is an improvement upon units of the type shown in U.S. Pat. No. 3,486,419, though that unit is one which lends itself to servicing in the field, though it is of a somewhat different structure from that described herein.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a side view, partly in section, of one embodiment of this invention.

FIG. 2 is a side view, partly in secton, of another embodiment of the piston which may be utilized in FIG. 1.

FIG. 3 is an end elevational view of FIG. 2.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

FIG. 1 shows the assemblage or unit which generally consists of a cylinder **10**, a piston **11**, and a piston rod **12**. The cylinder **10** is in two cylindrical pieces **13** and **14** which are secured together by means of a weldment **16**. The cylinder piece **13** has a large interior wall **17**, and the piece **14** has a smaller interior wall **18**, so the pieces **13** and **14** are of different interior diametrical sizes. Thus the cylindrical wall **18** forms the bearing for the cylindrical rod **12**, as shown. Further, the piston **11** includes an enlarged end **19** which is circular and disc-shaped and which is of the circular size of the larger circular interior **17** and which is snugly slidably disposed within the piece **13**.

The rod **12** has a hollow interior **21** for the entire length of the rod **12**, and the piston **11** has a plug end **22** which is smaller in diameter than the diameter of the piston head or portion **19**. Thus the end **22** telescopes within the end **23** of the rod **12**. The rod end **23** has threads **24** on the interior thereof, and the piston has threads **26** engaged with the threads **24** for the assembly of the piston **11** with the rod **12**. A gasket **27** may be disposed between the rod **12** and the piston head **19** for further fluid-tightly sealing, that is beyond the fluid tightness provided by the threads **24** and **26**, between the piston **11** and rod **12**.

At this time it will also be noted that the piston head or portion **19** presents a ring-shaped wall **28** which abuts the ring-shaped wall **29** of the cylinder piece **14** when the piston and rod assembly are moved to their extreme right-hand direction shown in FIG. **1**. With this arrangement, the wall **29** provides a firm stop for the piston and rod assembly, and there is no damage to the parts. Further, the piston **19** is of a smooth circular exterior shape and it therefore smoothly slides in the cylinder interior **17** and does not score or otherwise damage the parts.

A cap **29** is secured to one end of the cylinder **10** by means of a weldment **31**, and the cap **29** has a reduced circular portion **32** telescoped within the cylinder **10**. Further, the cap **29** has a conically-shaped end **33** which terminates in an end wall **34** which is shown to be in abutment with the piston face **36** when the piston **11** is in the extreme leftward position as shown in FIG. **1**. The cylinder **10** also has a port **37** for the passage of fluid, either pneumatic or hydraulic, relative to the interior of the cylinder **10**. A threaded fitting or connector **38** is shown secured to the cylinder **10** by the weldment **39** for conducting the fluid flow relative to the port **37**.

It will therefore be seen and understood that the cap **29** and the piston **11** and the port **37** are all arranged so that a space **41** is provided in the cylinder **10** even when the piston **11** is in its lefthand end limit position shown in FIG. **1**. Therefore, working fluid can always be introduced into the cylinder **10** and it will be applied against the piston face **36** to activate the piston.

In connection with the aforementioned, it will be seen and understood that the assemblage shown is of a single acting type of cylinder. In this context, it should also be appreciated that the lefthand end of the cylinder **10**, as just described, is of optimum compactness but yet assures fully satisfactory and efficient operation of the assemblage. That is, the cap inner portions **32** and **33** serve the respective functions of mating with the cylinder **10** and providing a stop for the piston **11** and also for providing the fluid inlet space **41**.

The cap **29** has an opening **42**, and the rod **12** has an opening **43**, and the openings **42** and **43** are available for mounting the assemblage between two points, such as mounting pins which are not shown but which are commonly used in the mounting of power cylinders.

The cylinder wall **18** has a ring-shaped fluid seal **44** disposed within a groove **46** in the wall **18**. The seal **44** thus prevents the escape of fluid from the interior of the cylinder **10** and along the circular exterior of the rod **12**, since the seal **44** is interposed between the cylinder **10** and the rod **12**, as shown. Also, a ring-shaped wiper **47** is disposed at the end wall **48** of the cylinder **10** and is in contact with the exterior circular surface **49** of the rod **12**. Thus the seal **44** and the wiper **47** serve their standard functions of fluid sealing and dirt wiping along the rod exterior **49**.

The piston **11** and rod **12** are threaded together, as described and shown, and it will be noted that the piston **11** is shown to have the boss or reduced portion **22** broken away to show the interior thereof. These pieces **11** and **12** are screwed together while they are within the cylinder **10**, and the piston **11** is held against rotation, or conversely is rotated, by means of a tool, such as a spanner wrench, which can reach into the hollow rod **12** and which has two teeth for being received by and thus engaging the two openings **51** in the piston **11**. It will therefore be understood that the assemblage can be created by positioning the piston **11** within the cylinder **10** and then securing the cap **29** on the cylinder **10**, and this could actually be by threading the cap **29** into the cylinder **10**. The rod **12** can be inserted into the cylinder **10**, and the piston **11** and rod **12** can then be screwed together, by virtue of the spanner wrench or like tool and by virtue of the hollow rod **12** and formation of the piston **11** with the tooling portions **51**.

An important feature is that by use of the spanner wrench or like tool, the piston **11** and rod **12** can be disassembled, and the seal **44** can then be serviced or replaced. This servicing can be done in the field, and no other part of the assemblage need be taken off or apart. Also, the wiper **47** could also likewise be replaced, and even the rod **12** could be serviced or replaced, all by virtue of the disassembly feature described. The tool or spanner wrench is not shown, and it need not be shown since it is of a obvious or conventional design and is readily understood by one skilled in the art.

FIG. **3** shows a modified configuration of the tool-receiving portion of the piston which is designated **52** in FIGS. **2** and **3**. Thus the piston boss or inner portion **22** is shown to have a hexagonally-shaped opening **53** axially disposed in the piston **52** and in lieu of the spaced-apart openings **51** in the piston **11**. Thus, in the embodiment shown in FIGS. **2** and **3**, it will be readily understood that the inner end of the tool would be hexagonally shaped in a stud which is snugly received in the hexagonal opening **53** to thus control the piston **52** in the screwing assembly and disassembly of the piston **52** and the rod **11**.

In making these field repairs as described, one need not go through the port opening **37** for disconnecting the piston **11** from the rod **12**. That is, in the prior arrangements where access is made through the port **37**, this entails the disconnection of the fluid line with the fitting **38**, and this in turn would involve the exposure of fluid pressure to the atmosphere and would open the system to where it is subjected to air and dirt and to other hazards.

Also, by virtue of the end cap large flat wall **34**, along with the snug fit of the piston circular wall **19** in the cylinder **10**, the piston **11** can be squarely and firmly controlled for the screwing action described, though no intricate or difficult maneuvering is required in order to mate the piston **11** and rod **12**. Further, in the action of the assemblage itself and in achieving the leftward position shown in FIG. **1**, the piston **11** can safely abut the end cap wall **34** without any damage to the parts, and this is in distinction to the U.S. Pat. No. 2,987,046 where the left-end limit of the assemblage is obviously subjecting the piston and end cap mating surfaces to damage. Still further, in that type of prior art unit, the entire end of the cylinder is bulky and complex in manufacture, as shown and as compared to the unit described herein.

What is claimed is:

1. In a fluid-actuated cylinder assemblage a cylinder having a fluid port, a cap on one end of said cylinder, a piston slidably disposed in said cylinder, a piston rod threaded to said piston and being slidable in said cylinder for reciprocation of said piston and said rod in said cylinder, a fluid seal interposed between said cylinder and said rod, the improvement comprising said rod being cylindrical and having a hollow interior for the entire length of said rod and with said piston being threaded into one end of said hollow rod to fluid-tightly close said rod end, and said piston having a tool-engagable portion contiguous to said hollow interior of said rod and being disposed to be accessible to a tool through the other end of said rod for the control of said piston in the relative rotation of said piston and said rod in screwing the latter two in assembly and disassembly of the assemblage.

2. The assemblage as claimed in claim 1, wherein said cap has a wall faced toward said piston and abuttable with one face of said piston for limiting the axial movement of said piston toward said one end of said cylinder during said assembly and disassembly and during the operation of said assemblage, and said port being located and said cap and said piston, in the position of said limit of axial movement of said piston being disposed and shaped to define a space in said cylinder all for the entry of fluid into said cylinder through said port and against said one face of said piston.

3. The assemblage as claimed in claim 2, wherein one end of said cap includes a cylindrical portion telescopically extending into said cylinder and being fluid tight with said cylinder, said cap one end terminating in a reduced portion between said cylindrical portion and said wall to spaced from the interior wall of said cylinder for defining said space.

4. The assemblage as claimed in claim 1, wherein said tool-engagable portion is an opening in said piston and is faced toward said other end of said rod for receiving the tool.

5. The assemblage as claimed in claim 1, wherein said cylinder includes two pieces of different internal diameters, said piston being of a circular shape of the size of the larger of said cylinder diameters and being snugly slidably disposed in said larger diameter piece, said smaller diameter piece having an end extending into said larger diameter piece and presenting an abutment for limiting the movement of said piston in the axial direction away from said cap.

6. The assemblage as claimed in claim 5, wherein said rod is of an outer diameter of the size of said smaller diameter and is snugly slidably telescoped with said smaller diameter, and said seal is disposed spaced inwardly from the outer end limit of said smaller diameter piece and is accessible for replacement only when said piston and said rod are unscrewed and said rod is removed from said cylinder.

7. The assemblage as claimed in claim 1, wherein said seal is disposed adjacent the end of said cylinder opposite the location of said cap and spaced from the latter said cylinder end and is accessible for replacement only when said piston and said rod are unscrewed and said rod is removed from said cylinder.

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