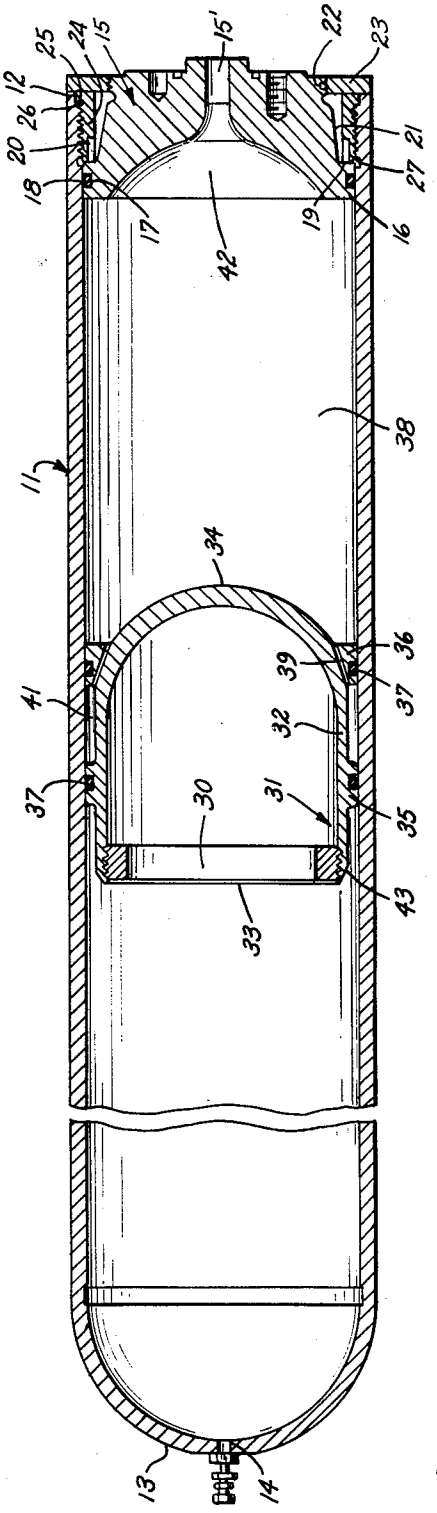
Nov. 24, 1964 E. M. GREER 3,158,180

BLIND SHELL PISTON ACCUMULATOR

Filed Dec. 28, 1960



INVENTOR.
EDWARD M. GREER

BY
Dean, Fairbank & Hirsch
ATTORNEYS

United States Patent Office 3,158,180
Patented Nov. 24, 1964

3,158,180

BLIND SHELL PISTON ACCUMULATOR

Edward M. Greer, Beverly Hills, Calif., assignor to Greer Hydraulics, Inc., a corporation of New York

Filed Dec. 28, 1960, Ser. No. 78,936
4 Claims. (Cl. 138—31)

This invention relates to the art of pressure vessels, more particularly to a pressure accumulator of the piston type.

As conducive to an understanding of the invention, it is noted that where in pressure vessels, such as pressure accumulators of the piston type closure members are used at each end of the vessel of diameter substantially equal to the internal diameter of the pressure vessel itself, the relatively large area between the closure member and the pressure vessel defines a region that is likely to permit leakage more particularly on the gas side of the accumulator as gas is much harder to seal than oil.

It is accordingly among the objects of the invention to provide a piston type pressure vessel, more particularly a piston accumulator, which has a minimum number of parts and may be readily fabricated at relatively low cost, and which will greatly minimize likelihood of leakage of gas from the gas side of the device.

According to the invention, these objects are accomplished by the arrangement and combination of elements hereinafter described and more particularly recited in the claims.

In the accompanying drawing is shown one of various possible embodiments of the several features of the invention, the single figure is a longitudinal sectional view of the pressure accumulator.

Referring now to the drawing, the pressure accumulator comprises a substantially cylindrical casing **11** of rigid material capable of withstanding high pressure.

The casing is formed by drawing a shell of suitable metal so that the major portion of the body of the casing is cylindrical, having a threaded opening **12** at one end, with the other end **13** of the casing being hemispherical as shown. The hemispherical end has an axial port **14** therein of relatively small diameter, i.e. a fraction of the diameter of the casing itself, said port defining the gas inlet port of the accumulator.

The end **12** of the casing is closed by means of a plug **15** having an axial bore **15'** defining the liquid port of the accumulator. As shown, the plug **15** is cylindrical at its inner end, as at **16**, being of diameter just slightly less than that of the casing **11** so that it may fit therein with but a slight clearance. The cylindrical portion **16** of the plug has an annular groove **17** in which an O ring **18** is positioned to provide a seal.

The plug **15** is of reduced diameter outwardly from said cylinder portion **16**, defining an annular shoulder **19** and said reduced diameter portion is substantially conical, tapering inwardly toward the axis of said plug, as at **21**. The outer extremity of said plug is also cylindrical, as at **22**, and desirably is threaded to receive a lock nut **23** of outer diameter such that its periphery will rest against the thread opening **12** of the casing **11**, as is clearly shown.

To retain the plug **15** in the casing **11** under the pressure contained therein, a lock sleeve **24** is provided externally threaded to coact with corresponding threads on the inner surface of the casing **11** adjacent the end **12** thereof. The outer end of said lock sleeve **24** desirably has an outwardly extending flange **25** adapted to seat on an annular shoulder **26** formed at the end of the casing **11**. The inner end of the lock sleeve **24** desirably is bevelled on its outer surface as at **27** and the annular shoulder **19** of the plug **15** is adapted to abut against said bevelled inner end, as shown, to limit outward movement of the plug **15**.

The lock sleeve has suitable conformations **20** at the end remote from flange **25** to permit insertion therein of a suitable tool for rotation of the lock sleeve **24** when the unit is to be disassembled.

By reason of the flange **25**, the lock sleeve **24** can only be inserted with the conformations **20** thereof at its lower end. Hence as the side wall of plug **15** is closely adjacent the locking conformation **20**, it is apparent that such plug cannot be removed so long as there is any substantial pressure remaining in the accumulator.

Thus, when there is pressure in the accumulator, the plug **15** will be urged outwardly so that its shoulder **19** will abut against the inner end of the lock sleeve **24**, retaining the plug in position. So long as there is pressure in the unit, no access is provided to permit insertion of a tool into the conformations **20** to rotate the lock sleeve. This sleeve can only be rotated when the pressure in the accumulator has been reduced to a point such that the plug **15** can be moved inwardly after the lock nut **23** is removed to provide access to the conformations **20** to permit insertion of a tool that can engage the appropriate conformations on the inner surface of the lock ring for rotation of the latter for removal of the same.

Slidably mounted in the casing **11** is a piston **31** which desirably comprises a sleeve **32** open at one end, as at **33**, and having its other end **34** closed, said closed end being substantially hemispherical as shown, and formed as an integral part of the sleeve **32** as by drawing the entire assembly. Preferably formed integral with the sleeve **32** is a pair of spaced annular members **35**, **36** of outer diameter but slightly less than the inner diameter of the casing **11** to provide but slight clearance therebetween sufficient for ready movement of the piston. Each of the annular members has an annular groove therein in which an O ring **37** is positioned to provide a seal and the annular member **36** adjacent the oil chamber **38** of the accumulator has a passageway **39** therethrough to provide communication between the annular space **41** between the annular members **35**, **36** and the oil chamber **38** to prevent excessive pressure developing in said space **41** in use of the device which might cause extrusion of said O rings.

As shown, the inner surface of the plug **15** has a recess **42** therein of configuration complementary to that of the hemispherical end **34** of the piston **31** so as to receive the latter when the piston is bottomed against such plug **15**. The open end **33** of the piston desirably has its outer periphery bevelled, as at **43**, so that when such bevelled end abuts against the hemispherical end **13** of the casing **11** it will not wedge in place, thereby permitting free movement of the piston.

To reinforce the open end **33** of the piston **31** a ring member **30** is provided, externally threaded to coact with corresponding threads on the inner surface of the open end of the piston.

By reason of the use of the drawn-type shell with the hemispherical end **13** that is an integral part of the unit, it is apparent that there will be no opening on the gas side of the accumulator that requires a plug for closure of diameter greater than a fraction of the diameter of the casing **11**. Thus, the only opening on such gas side is the port **14** through which gas is directed and this port is of course of relatively small diameter.

As many changes could be made in the above construction and many apparently widely different embodiments of this invention could be made without departing from the scope of the claims, it is intended that all matter contained in the above description, or shown in the accompanying drawings, shall be interpreted as illustrative and not in a limiting sense.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent of the United States is:

1. A pressure vessel comprising a cylindrical forged casing having a cylindrical opening at one end and having its other end closed and substantially hemispherical, said closed end being an integral part of the casing, a piston having a hemispherical portion at one end, said piston being slidably mounted in said casing, the end of the piston in the chamber of said pressure vessel adjacent the hemispherical end of the casing having its outer periphery bevelled and adapted to abut against the inner surface of the hemispherical end of said casing, a plug releasably secured in the open end of the casing, said plug having a recess in its inner end of curvature complementary to the curvature of the hemispherical end of said piston to receive the latter, said plug having a port therethrough for fluid, said closed end having a port therethrough of diameter a fraction of the diameter of said casing.

2. The combination set forth in claim 1 in which said piston comprises a sleeve, one end of which is open and the other end of which is closed, said closed end of the sleeve being substantially hemispherical and integral with the sleeve, and a reinforcing ring is positioned in said sleeve at the open end thereof.

3. The combination set forth in claim 1 in which said end plug has a cylindrical portion at its inner end and is of reduced diameter outwardly from said cylindrical portion defining an annular shoulder, said reduced portion tapering inwardly toward the axis of said plug, with the outer end of said reduced portion being substantially cylindrical, a lock sleeve encompassing the tapered portion of said plug, said lock sleeve having a threaded outer periphery, the inner surface of the open end of said casing being correspondingly threaded to receive said lock sleeve, said annular shoulder abutting against the inner end of said lock sleeve, to limit the outward movement of said plug, the outer end of said lock sleeve having an outwardly extending flange and the end of said casing having an annular seat adapted to receive said flange to limit the inward movement of said lock sleeve, said lock sleeve having tool insertion means at the inner end thereof to permit rotation of said lock sleeve for removal thereof, said tool insertion means being aligned with the inner end of the reduced diameter portion of said plug when the shoulder of said plug abuts against the inner end of said lock sleeve.

4. The combination set forth in claim 3 in which a lock nut encompasses the cylindrical outer end portion of said plug, and abuts against the end of said casing.

References Cited in the file of this patent

UNITED STATES PATENTS

2,734,531	Bizak	Feb. 14, 1956
2,828,760	Taylor et al.	Apr. 1, 1958
2,845,138	Gageby	July 29, 1958