Oct. 2, 1956 T. J. McCUISTION 2,764,998

ACCUMULATORS

Filed Oct. 22, 1953

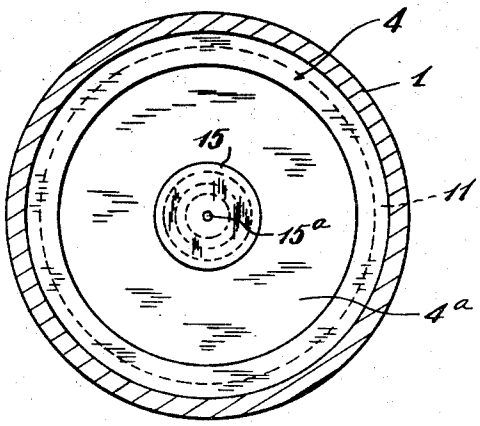


FIG. 2

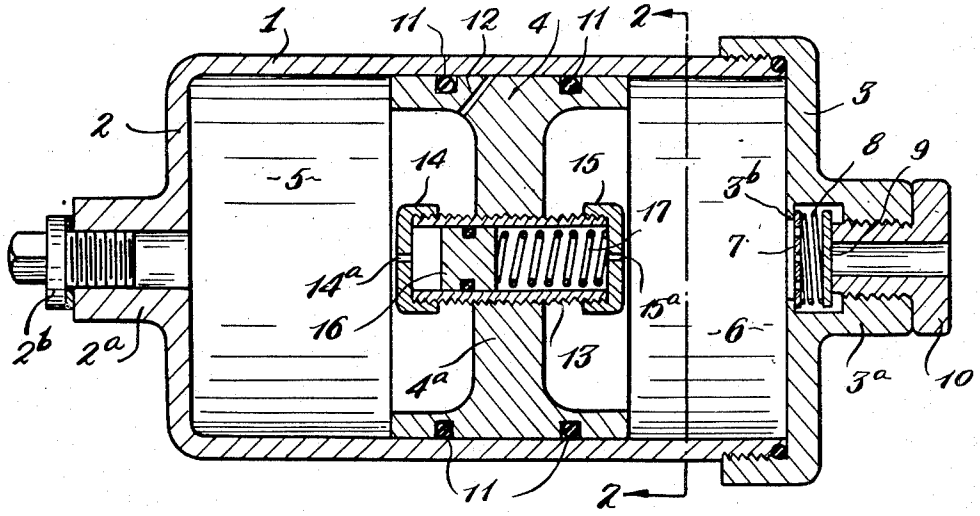


FIG. 1

INVENTOR.
TOMMY J. McCUISTION
BY
Milburn & Milburn
ATTORNEYS

United States Patent Office 2,764,998 Patented Oct. 2, 1956

2,764,998

ACCUMULATORS

Tommy J. McCuistion, Euclid, Ohio

Application October 22, 1953, Serial No. 387,653

5 Claims. (Cl. 138—31)

This invention relates to the art of accumulators of the piston type.

As stated in my co-pending applications, in the use of a piston type of accumulator in connection with hydraulic equipment, as for instance in an airplane, the piercing of the wall of the storage chamber for the oil or other liquid might cause sufficient increase in internal pressure to produce an explosion-like bursting of the accumulator walls and a consequent scattering of the metal particles. This of course might prove to be very serious and hence this type of accumulator is a real hazard under such conditions. This old type of accumulator is objectionable also because of the transmission of vibrations or surging due to the operation of the pump connected to the same.

Accordingly, one object of my present invention is to devise a piston type of accumulator with means for quickly absorbing increased internal pressure due to displacement by a bullet or other object piercing the wall and entering the liquid-storage chamber of the accumulator.

Another object is to devise an accumulator of this type that is capable of absorbing minor fluctuations or surges of internal pressure that might be due to impulses of the pump or other hydraulic mechanism associated therewith.

Another object is to devise an accumulator of this type in which the main piston itself is provided with an auxiliary piston or plunger that is directly exposed to the pressure within the liquid-containing chamber of the accumulator and that is at once responsive thereto in such manner as to relieve the same at least to a partial extent so as to supplement the effect of the main piston in together relieving entirely any such excessive pressure.

The present disclosure contains certain specific details of construction which are to be considered as forming part of my present invention and as constituting one of the objects thereof.

Other objects will appear from the following description and claims when considered together with the accompanying drawing.

Fig. 1 is a longitudinal sectional view of a device embodying my present invention; and

Fig. 2 is a view taken on line 2—2 of Fig. 1.

It is to be understood that the present form of disclosure is merely for the purpose of illustration and that there might be various modifications without departing from the spirit of my invention as herein set forth and claimed.

Referring now to the accompanying drawing in detail, the metal cylinder 1 has the end heads 2 and 3 secured thereto by means of screw-threaded engagement or in any other suitable manner. The recriprocatable piston 4 divides the interior of the cylinder into a liquid-containing chamber 5 and a gas chamber 6. That is, the chamber 5 is adapted for the storage of oil, for instance, while the gas-filled chamber 6 is adapted to absorb any excessive pressure within the liquid-containing chamber 5 by movement of the piston towards the right, as viewed in Fig. 1 of the accompanying drawing.

The nozzle 2*a* may be closed by the screw form of plug 2*b* or in any other suitable manner. Likewise any suitable valve may be provided in the end head 3 for supplying the gas therethrough and for holding the same against accidental escape from the gas chamber 6. In the present form of disclosure the end head 3 has a nozzle 3*a* and is provided with an inwardly peened-over annular flange 3*b* for engagement by the apertured disk 7 which is held thereagainst by the coil spring 8. The other end of the spring 8 has bearing engagement against the disk 9 which has closing engagement against the inner end of the screw-threaded open plug 10 in the nozzle 3*a*. When pressure is applied inwardly against the disk 9, either by the entering gas or by means of a suitable tool through the open plug 10, the gas may be supplied to the chamber 6 or discharged therefrom. Upon relief of the pressure upon the disk 9, the same will be closed by the spring 8 and held in such closed position so as to prevent accidental escape of the gas from the chamber 6.

The piston 4 is of substantially I-form in cross section so as to provide a substantial extent of wall engagement with the cylinder and thereby ensure against accidental cocking of the piston therewithin and also to provide a middle transverse portion 4*a*. In other words, the present form of piston consists of a middle wall 4*a* and the opposite cupped-out portions facing the two chambers 5 and 6, respectively, these cupped-out portions being of sufficient depth to serve the purpose to be explained. The wall of the piston is provided with duplicate O sealing rings 11 of elastic composition and a suitable number of vents for preventing pressure lock in the clearance between the sealing rings.

Through the centre of the piston wall 4*a* there extends to an equal extent upon both sides thereof the open-end auxiliary cylinder 13 which may have screw-threaded engagement therein and which may have the screw-threaded end heads or caps 14 and 15, respectively, with their central restricted apertures 14*a* and 15*a*. Within the cylinder 13 there is the reciprocatable piston 16 with an O ring providing sealing engagement with the cylinder wall and with a coil spring 17 arranged between one end of the piston and the end cap 15. That is, the spring 17 is located upon the side of the piston 16 towards the gas chamber 6. It is to be observed that the over-all length of the auxiliary piston assembly is within the longitudinal extent of the piston 4, as indicated in the accompanying drawing. Also, the cupped-out portions upon the opposite sides of the piston 4 serve to amplify the capacity of the chambers 5 and 6, respectively.

With the form of device shown in the present drawing, any excessive pressure in the liquid-containing chamber 5 will cause the auxiliary piston 16 within its cylinder 13 to move towards the right, as viewed in the present drawing, against the tension of the spring 17 and to cause compression of the gas within the right-hand end of the auxiliary cylinder and also within the main gas chamber 6 by virtue of the restricted communicating aperture 15' through the end head or cap 15. Also, the main piston 4 may be forced towards the right, as viewed in the present drawing, by the continued excessive pressure in the chamber 5. Thus, in addition to the movement of the pressure-responsive main piston 4, there will be the response of the more sensitive auxiliary piston or plunger 16 so as to obtain a very efficient absorption and prevention of any shock that might otherwise result from excessive pressure within the liquid-containing chamber and thereby preclude damage incident thereto.

What I claim is:

1. An accumulator comprising a cylinder, a piston

reciprocatable longitudinally within said cylinder and dividing the interior of said cylinder into separate chambers for a liquid and gaseous body, respectively, said chambers having inlet and outlet openings through the wall of said cylinder for passing the liquid and gaseous body, respectively, said piston being provided with a centrally disposed auxiliary cylinder wall, and a plunger mounted in said auxiliary cylinder wall and extending longitudinally and co-axially of said cylinder in such manner as to be responsive to pressure within said liquid-containing chamber in one direction and having a spring tending to force the same in the opposite direction.

2. An accumulator comprising a cylinder, a piston reciprocatable longitudinally within said cylinder and dividing the interior of said cylinder into separate chambers for a liquid and gaseous body, respectively, said chambers having inlet and outlet openings through the wall of said cylinder for passing the liquid and gaseous body, respectively, an auxiliary cylinder extending co-axially through and supported by said piston, a plunger reciprocatable within said auxiliary cylinder and exposed to the pressure within said liquid-containing chamber so as to respond thereto in one direction and having a spring tending to force the same in the opposite direction, and said auxiliary cylinder having restricted openings at its two ends in communication with said chambers for the liquid and gaseous body, respectively.

3. The same structure as recited in claim 2 hereof and in which said piston consists of a single transverse wall with a centrally disposed aperture within which is mounted said auxiliary cylinder, said auxiliary cylinder having end closures in which said restricted openings are provided for transmission of pressure therethrough, and the spring of said plunger being in the form of a coil having bearing engagement at its outer end against the adjacent closure end of said auxiliary cylinder.

4. An accumulator comprising a cylinder, a piston reciprocatable longitudinally within said cylinder and dividing the interior of said cylinder into separate chambers for a liquid and gaseous body, respectively, said chambers having inlet and outlet openings through the wall of said cylinder for the liquid and gaseous body, respectively, said piston being of substantially I-form in cross section so as to provide cupped-out portions of substantially equal capacity upon the opposite sides thereof, said piston being provided with a centrally disposed auxiliary cylinder wall, an auxiliary sealed plunger mounted within said auxiliary cylinder wall and extending longitudinally and co-axially thereof in such manner as to be responsive to pressure in one direction within said liquid-containing chamber and having a spring tending to force the same in the opposite direction, and the longitudinal extent of said auxiliary plunger being within the longitudinal limits of said piston.

5. An accumulator comprising a cylinder, a piston reciprocatable longitudinally within said cylinder and dividing the interior of said cylinder into separate chambers for a liquid and gaseous body, respectively, said chambers having inlet and outlet openings through the wall of said cylinder for the liquid and gaseous body, respectively, said piston being of substantially I-form in cross section so as to provide cupped-out portions of substantially equal capacity upon the opposite sides thereof, an auxiliary cylinder extending co-axially through and supported by said piston and having end closures each with a centrally disposed restricted aperture for transmission of pressure therethrough, the longitudinal extent of said auxiliary cylinder and closures therefor being within the cupped-out portions of said piston, a reciprocatable plunger within said auxiliary cylinder exposed to the pressure within said liquid-containing chamber so as to respond thereto, and a coil spring arranged between said plunger and the end closure adjacent the chamber for the gaseous body.

References Cited in the file of this patent

UNITED STATES PATENTS

366,368	Bennett et al.	July 12, 1887
1,315,089	Camfield et al.	Sept. 2, 1919
1,806,713	Schwarzkopf	May 26, 1931
2,440,065	Ashton	Apr. 20, 1948

FOREIGN PATENTS

429,749	France	of 1911