March 10, 1953 J. N. PAQUIN 2,630,887

HYDRAULIC LOCK FOR ADJUSTABLE CHAIR BACKS

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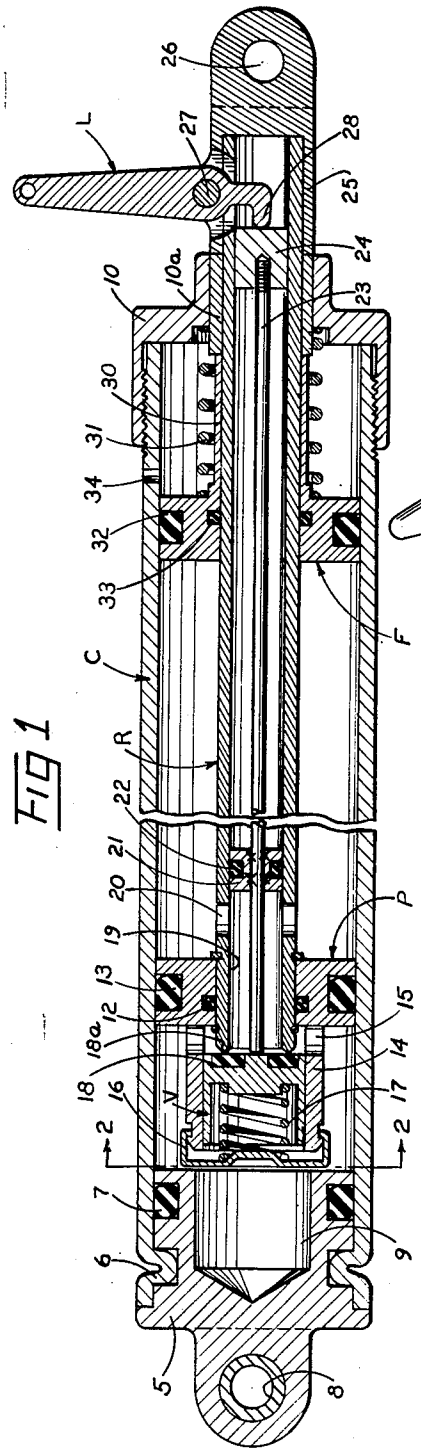



FIG 1

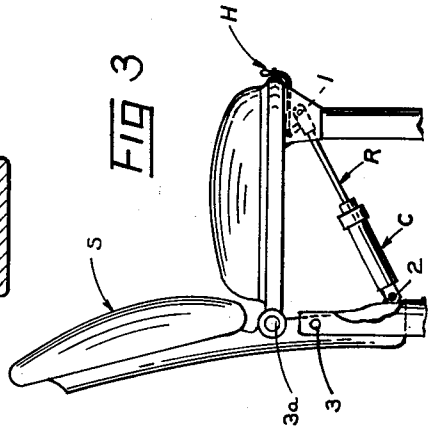



FIG 3

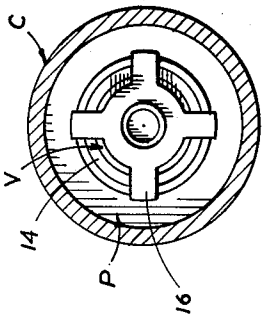



FIG 2

INVENTOR.
JOSEPH NORMAN PAQUIN

BY Richey + Watts

ATTORNEYS

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## HYDRAULIC LOCK FOR ADJUSTABLE CHAIR BACKS

Joseph Norman Paquin, Euclid, Ohio, assignor to The Weatherhead Company, Cleveland, Ohio, a corporation of Ohio

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3 Claims. (Cl. 188—96)

1

This invention relates to a hydraulic seat-positioning mechanism, more particularly to a mechanism which is used in conjunction with a seat having a pivoted or angularly adjustable back in order to give the passenger control over the angle of the seat back in accordance with his desires.

It is an object of this invention to provide a seat-positioning mechanism which positively positions the back of the seat against the weight of the passenger at all times but which can be released manually by the passenger so that the back inclines under his weight and which again becomes positively positioned against the passenger's weight when the manual control means are released. Briefly, this is accomplished by connecting a portion of the hinged seat back to a fixed portion of the seat by a hydraulic piston and cylinder assembly which is so constructed and arranged that the assembly prevents an increase in angle of the hinged seat by interposing a hydraulic block, there being a manually controlled valve in the assembly which can be opened to remove the hydraulic block and permit angular adjustment of the seat back.

Another object of this invention is to provide means whereby the back of the seat can be manually pulled to its vertical position without interference by the hydraulic seat lock and without need for manipulation of the manual control means mentioned previously. I accomplish this by making the piston and cylinder assembly relatively movable at all times in the direction tending to cause the seat to become vertical whereas, as mentioned above, the parts are only relatively movable in the other direction when the manual control means are manipulated. These and other objects will be apparent as the following detailed description of the preferred form of my invention proceeds.

In the drawings:

Fig. 1 is a longitudinal section through the hydraulic lock;

Fig. 2 is a transverse section taken on 2—2 of Fig. 1; and

Fig. 3 is a schematic diagram showing how the hydraulic seat lock may be installed on a tilting back chair.

The piston rod R in the hydraulic assembly is pivoted to the fixed part of the seat as at 1 and H is remote control means for operating lever L when it is desired to increase the angle of the seat back. The cylinder C may be pivoted as at 2 to a portion of the reclining seat back S, which back is pivoted to a fixed part of the

2

seat as at 3. The rear of the seat may be supported by the back by a pivot 3a. The front portion of the seat may slide on the front support. It can be seen from Fig. 3 that in order to cause the back S to assume a greater angle with the fixed part of the seat, cylinder C and the piston rod R must telescope together whereas when the pivot back S is straightened up or brought into a more vertical position the cylinder and piston rod tend to separate. As will be described presently, the hydraulic mechanism is so arranged that weight of the passenger against the back S cannot pivot the back and cause it to tilt to a greater angle because the cylinder and piston rod are hydraulically blocked, but this block is removed when the lever L is operated by the manual control means H. On the other hand, whenever the porter or anyone else wishes to straighten up the seats the hydraulic device is designed so that they can be moved to the vertical without manipulation of the control handle and lever. The passenger can straighten the seat back by hitching the seat forward with the weight of his body.

The hydraulic mechanism and its construction is most clearly shown in Figs. 1 and 2. The cylinder member C has at one end a cap 5 which may be retained in the cylinder wall by crimped portion 6 thereof and which has a fluid seal means shown at 7. An apertured ear 8 may be formed on the cap, which member pivots to the back of the chair as at 2 in Fig. 3. The end cap may be counterbored as at 9 to reduce its weight and provide a chamber for fluid. The other end of the cylinder is closed by a centrally apertured cap 10 which may be threaded to the cylinder C. This cap may mount a bushing 10a to guide the piston rod R. Hollow piston rod R carries the piston P which may be retained on the piston rod by snap rings, by welding or by any other suitable fastening. It may be desirable to provide a seal 12 to prevent fluid from leaking between the piston rod and piston and another seal 13 may be provided to prevent leakage of fluid between the piston and cylinder wall.

An extension 14 may be integral with the piston P or attached thereto and it is apertured as at 15 for the passage of fluid. A spring retainer 16 is provided to retain a spring 17, the other end of which bears against a movable valve member V. Valve member V may be provided with a resilient seat washer 18 which makes fluid-tight seal with a seat 18a formed by the end of the hollow piston rod R. The aperture 19 in the hollow piston rod communicates with apertures 20

in the wall of the rod and thus the apertures **15**, **19** and **20** provide for communication between opposite sides of the piston P, provided that check valve V is in its open position.

A guide member **21**, which is sealed as at **22**, slides within the aperture **19** of the piston rod and supports a valve operating pin **23**. A plunger block **24** may be attached at one end to the pin **23** and it can be seen that as the pin **23** is moved to the left valve V is lifted from seat **18***a* and the free fluid communication between opposite sides of the piston referred to previously is established. An end piece **25** may be slipped over the end of the piston rod R and attached thereto by welding or pinned thereto which piece carries the pivot ear **26** so that the piston rod may be pivoted to the fixed part of the chair as shown at **1** in Fig. 3. The valve pin operating lever L is pivoted to the end piece **25** as at **27** and carries an operating shoe **28** for engagement with the plunger block **24**. Lever L may be operated by a Bowden wire or a series of links or any equivalent structure indicated generally at H in Fig. 3.

In order to accommodate for the differences in volume change between the free end of the piston and the end which is connected to the piston rod R, floating piston F is provided in the piston rod side of the assembly. This floating piston has a sleeve portion **30** which slides freely on the piston rod R and is urged to the left in the figure by the spring **31**. A seal **32** prevents escape of fluid past the piston adjacent the cylinder wall and another seal **33** prevents escape of fluid around the piston rod. A bleed hole **34** may be provided to prevent hydraulic block from occurring in case fluid leaks past the floating piston F into the closed chamber at the right.

In operation, when the passenger wishes to increase the angle of inclination of the seat back S, he manipulates handle H which moves lever L and lifts valve V off its seat **18***a*. Now free communication between the two chambers and the cylinder is established by means of apertures **15**, bore **19** and apertures **20**. Under these conditions the cylinder C can move to the right in the figure telescoping over piston P, and fluid which was formerly at the left of piston P was now displaced into the chamber at the right thereof. Due to the fact that there is no piston rod in the left chamber more fluid will be displaced from that chamber than could normally be accommodated by the right hand chamber. However, when this occurs floating piston F will merely be moved to the right to provide additional volume in the right hand chamber. The passages can be arranged and the check valve opening controlled so that this telescoping action is not too rapid in order to give the passenger sufficient time to sense his position and determine when it is satisfactory. Once he has determined this, the operator need only release the control handle and the spring **17** will cause the valve V to seat and block communication between the two chambers in the cylinder. Thus the weight of the passenger upon the back of the seat can no longer cause the seat to tilt and the seat is effectively locked in its selected position. Now, if the passenger wishes to straighten the seat or if at the end of the run the porter wishes to straighten all the seats he need not operate any controls, he need only grasp the seat and move it to its vertical position. This tends to pull the piston out of the cylinder and



in this direction fluid tends to pass from the right hand chamber into the left hand chamber of the cylinder. Fluid can pass in this direction by merely compressing the valve spring **17** slightly, causing the valve V to open and establish communication between the two chambers. Of course, when this occurs the floating piston makes up for the volume of the piston rod by moving to the left in response to pressure exerted by spring **31**.

Having completed the description of a preferred embodiment of my invention, it can be seen how I have provided a seat which can be adjusted to any angle by the passenger by merely operating the control and which can be returned to its normal vertical position without resort to operation of any controls, the latter feature being particularly important in a situation where one individual is charged with the duty of rapidly restoring a large number of seats to their vertical position as would occur in an airplane or passenger train at the end of the run.

Although I have shown the piston rod connected to the stationary part and the cylinder to the fixed part, it will be understood that this connection could be reversed. However, in this case the control lever L would move with the seat and the control linkage connections would be more complicated. Various design details that I have illustrated are not considered critical and may be modified in accordance with conventional practice without departing from the spirit of the invention as defined in the appended claims.

Having thus described the present invention so that others skilled in the art may be able to understand and practice the same, I state that what I desire to secure by Letters Patent is defined in what is claimed.

What is claimed is:

1. In a hydraulic unidirectional lock assembly, a cylinder closed at one end and having a wall at the other end with an opening therein, a piston rod extending through said opening and carrying a piston slidable in said cylinder, said cylinder and piston being assembled to provide fluid pressure and reservoir chambers at opposite sides of the piston, passageway means in said assembly connecting said chambers, valve means closing off said passageway means, said valve means being arranged so that fluid pressure in said pressure chamber tends to close the valve means when said piston tends to move into said pressure chamber, pressure in said reservoir chamber automatically opening said valve means when the piston is moved into said reservoir chamber, manual means to open said valve means to permit motion of the piston into said pressure chamber, a plunger in said reservoir chamber, and spring means urging said plunger in a direction to reduce the volume of said reservoir chamber to keep the reservoir and pressure chambers filled with liquid and free of air.

2. In a unidirectional hydraulic lock, an assembly comprising a cylinder, a piston in said cylinder, a piston rod extending through one end of said cylinder, said cylinder and piston being assembled to provide fluid pressure and reservoir chambers at opposite sides of the piston, passageway means in said assembly connecting said chambers, valve means closing off said passageway means, said valve means being arranged so that fluid pressure in said pressure chamber tends to close the valve when said piston tends to move into said pressure chamber, pressure in said reservoir chamber automatically opening said valve

when said piston moves into said reservoir chamber, manual means to open said valve to permit motion of said piston into said pressure chamber, a plunger in said reservoir chamber and slidably mounted on said piston rod, spring means urging said plunger in a direction to reduce the volume of said reservoir chamber and keep the reservoir and pressure chambers filled with liquid and free of air, and fluid seal means between said plunger and said piston rod and between said plunger and the cylinder.

3. In a unidirectional hydraulic lock, a cylinder, a piston in said cylinder, a hollow piston rod extending through one end of said cylinder, said cylinder and piston being assembled to provide fluid pressure and reservoir chambers at opposite sides of the piston, said hollow piston rod having a port in the wall thereof in said reservoir chamber and the end thereof opening into said pressure chamber, valve means closing off the end of said rod, said valve means being arranged so that fluid pressure in said pressure chamber tends to close the valve when said piston tends to move into said pressure chamber, pressure in said reservoir chamber automatically opening said valve when said piston moves into said reservoir chamber, manual means extending through said hollow rod to open said valve means, a plunger in said reservoir chamber and slidably



mounted on said piston rod, spring means urging said plunger in a direction to reduce the volume of said reservoir chamber and keep the reservoir and pressure chambers filled with liquid and free of air, and seal means between said plunger and said piston rod and between said plunger and the cylinder.

JOSEPH NORMAN PAQUIN.


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