Dec. 14, 1965 W. N. BAINBRIDGE ETAL 3,223,206

HYDRAULIC LOCKING MECHANISMS

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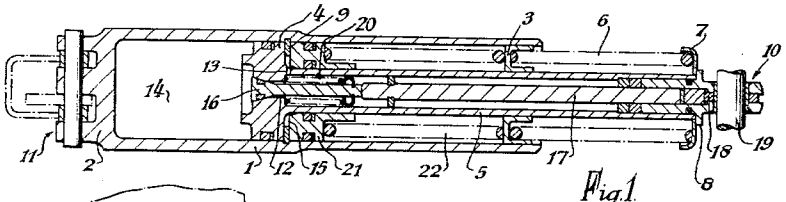


Fig. 1

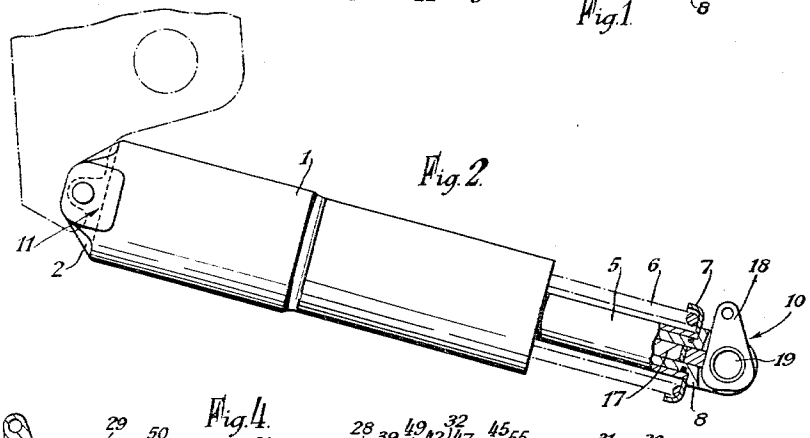


Fig. 2

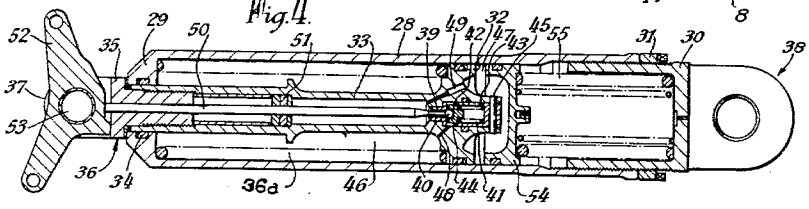


Fig. 4

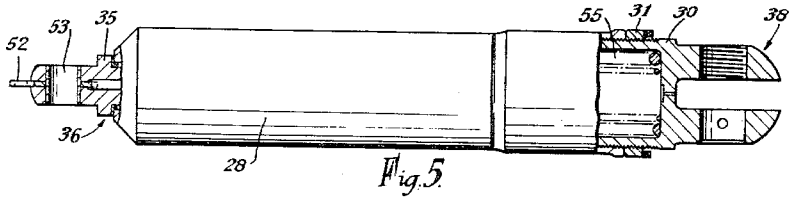


Fig. 5

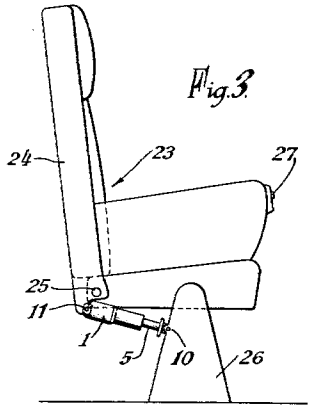
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HYDRAULIC LOCKING MECHANISMS

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Fig. 3



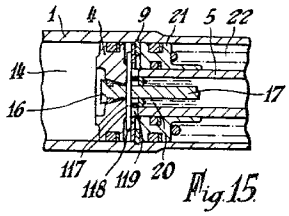
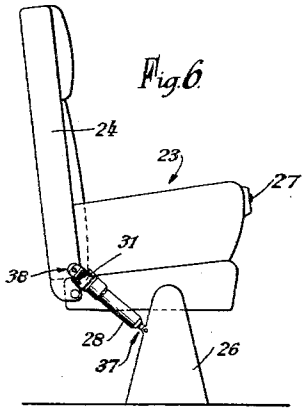


Fig. 15

Fig. 6



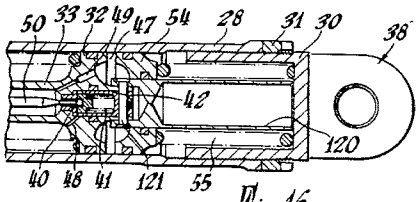


Fig. 16

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HYDRAULIC LOCKING MECHANISMS

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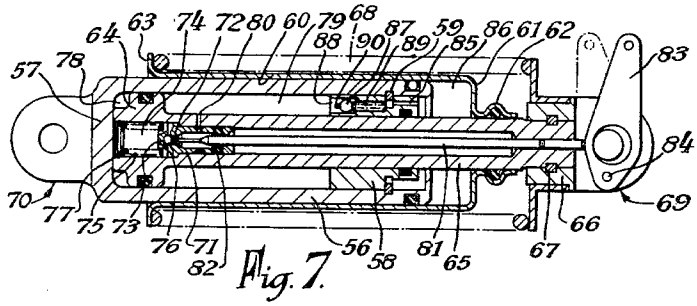


Fig. 7.

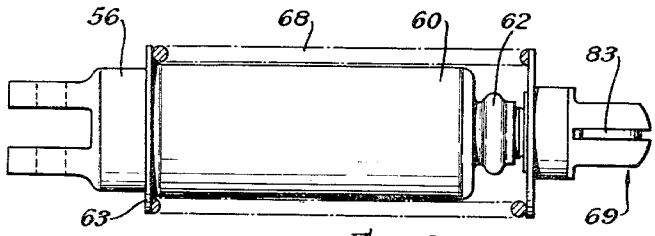


Fig. 8.

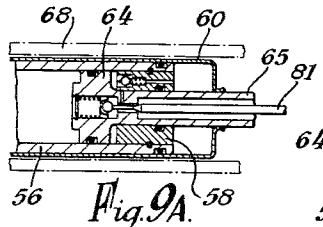


Fig. 9A.

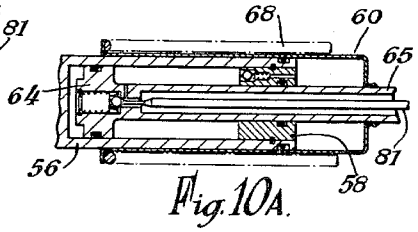


Fig. 10A.

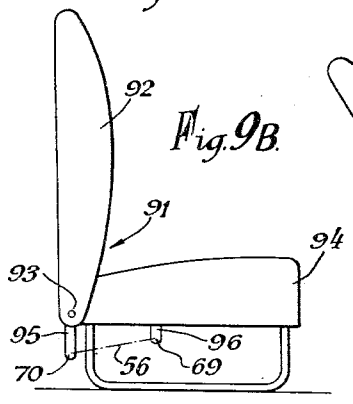


Fig. 9B.

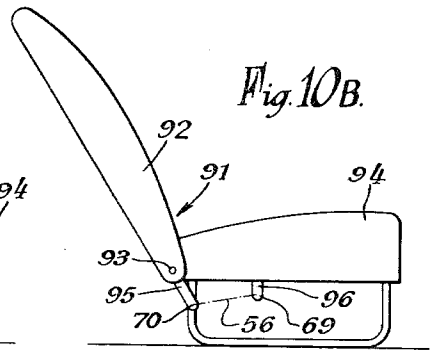


Fig. 10B.

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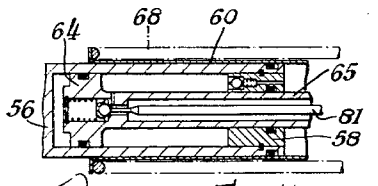


Fig. 11A.

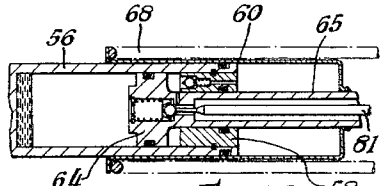


Fig. 12A.

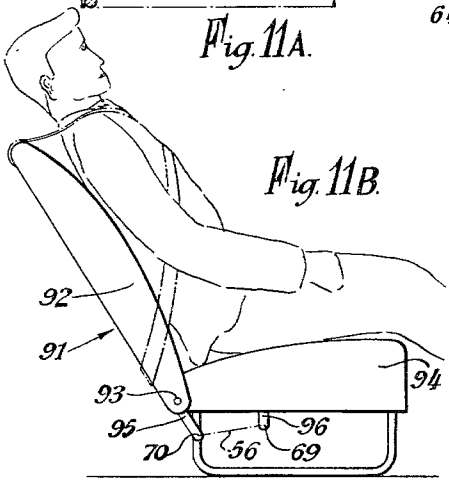


Fig. 11B.

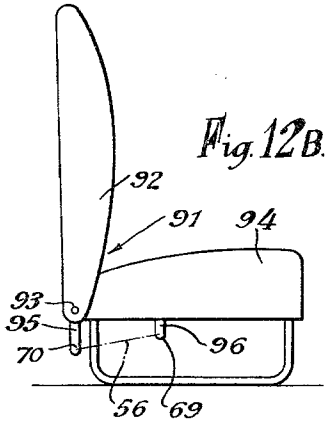


Fig. 12B.

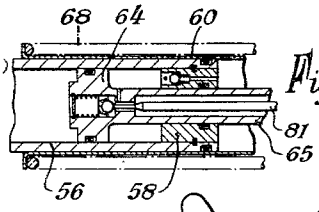


Fig. 13A.

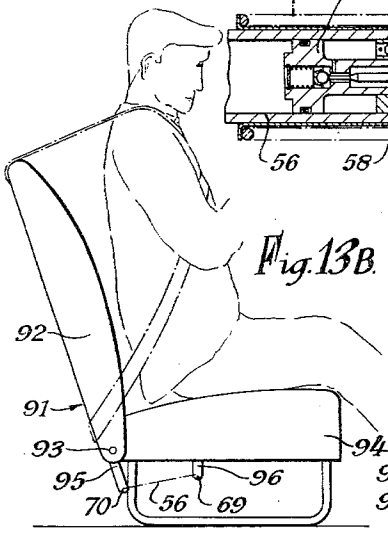


Fig. 13B.

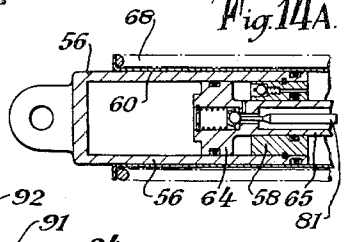


Fig. 14A.

Fig. 14B.

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United States Patent Office

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HYDRAULIC LOCKING MECHANISMS

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Filed Aug. 15, 1963, Ser. No. 304,716
1 Claim. (Cl. 188—96)

The present invention has for its object to provide a hydraulic locking mechanism for use for example for securing in an adjusted position members capable of linear or other movement relative to one another.

In a hydraulic locking mechanism according to the invention there is provided a hydraulic cylinder and a piston within said cylinder each adapted for connection to one of the members between which adjustment is required and a valve for controlling the flow of hydraulic liquid in the cylinder from one side of said piston to the other, said valve when in the closed position preventing the flow of the hydraulic liquid to produce a hydraulic lock holding the cylinder and piston against relative axial movement and when in the open position permitting the flow of hydraulic liquid in one direction from one side of the piston to the other upon application of an external load causing relative axial movement between the cylinder and piston or the flow of hydraulic liquid in the reverse direction when the said external load is released to permit relative axial movement between said cylinder and piston in a direction opposite to said first mentioned direction. The reverse flow of the hydraulic liquid can be caused by the release of a load created upon the application of the external load, the release of said external load permitting the created load to operate. For example the created load can be produced internally in the cylinder and utilised to move a further piston in the cylinder to displace the hydraulic fluid to cause the required reverse flow. With this arrangement movement of the members from the adjusted position, in one direction, is effected automatically when the valve is opened. The valve controlling the flow of hydraulic liquid in the cylinder can be moved between the open and closed position through valve actuating means located externally of the mechanism and if desired remote therefrom, said means being operable by an operator.

Embodiments of the invention will now be described by aid of the accompanying diagrammatic drawings in which:

FIGURE 1 shows in longitudinal section, a hydraulic locking mechanism according to one embodiment;

FIGURE 2 is an elevation partly in section, of the mechanism of FIGURE 1;

FIGURE 3 is a side view of for example an aircraft passenger seat having an adjustable seat back and incorporating the mechanism of FIGURE 1 arranged to lock the seat back in the adjusted positions;

FIGURE 4 shows in longitudinal section, a hydraulic locking mechanism according to a further embodiment of the invention;

FIGURE 5 is an elevation partly in section, of the mechanism of FIGURE 4;

FIGURE 6 is a side view of for example an aircraft passenger seat having an adjustable seat back and incorporating the mechanism of FIGURE 4 arranged to lock the seat back in the adjusted positions;

FIGURE 7 shows in longitudinal section, a hydraulic locking mechanism according to a still further embodiment of the invention;

FIGURE 8 is an elevation of the mechanism of FIGURE 7;

FIGURES 9 to 14 illustrate the use of the mechanism of FIGURE 7 with the seat of a road vehicle, the seat having an adjustable back, the figures including fragmentary views in section of the mechanism showing the condition of the mechanism corersponding to various positions of the seat back;

FIGURE 15 is a fragmentary view of FIGURE 1 and showing a modification thereto; and

FIGURE 16 is a fragmentary view of FIGURE 4 and showing a modification thereto.

Referring to FIGURES 1 and 2 of the accompanying drawings, the hydraulic locking mechanism comprises a hydraulic cylinder 1 closed at one end by an end wall 2 and at the opposite end by an annular end plug 3 disposed within the cylinder bore. The cylinder contains a piston 4 having a tubular piston rod 5 which extends through the aperture of the annular end plug 3 the outer end of the piston rod projecting outwardly from the cylinder bore. Spring loading acting between the cylinder and piston urges them to the extended condition as shown in the drawings. The spring loading is provided by a compression spring 6 one end of which abuts the outer face of the annular end plug 3 the opposite end abutting a spring cup 7 on the tubular piston rod, the spring cup being supported against a shoulder 8 on the said tubular piston rod. A spring retaining ring 9 in the bore of the cylinder limits the outward axial movement of the piston.

The outer end of the tubular piston rod 5 and the end wall 2 of the hydraulic cylinder opposite to the closed end through which the piston rod projects are each provided with coupling means shown generally at 10 and 11 respectively, through which the hydraulic locking mechanism can be attached to the members to be held in relatively adjusted positions.

The inner end of the bore of the tubular piston rod 5 terminates in a port 12 extending axially through the piston 4 a radial drilling or radial drillings 13 being provided in the wall of the tubular piston rod 5 behind the piston head 4 so that hydraulic liquid in the hydraulic cylinder can flow from one side of the piston to the other between the chamber 14 formed between one side of the piston and the closed end 2 of the cylinder and the annular space 15 on the other side of the piston formed by the tubular piston rod and the surrounding wall portion of the hydraulic cylinder. The flow of hydraulic liquid through the port is controlled by a valve 16 which is spring loaded by compression spring 20 so as normally to be held in a position to close the port 12 the valve being formed on the inner end of a tappet rod 17 extending through the bore of the tubular piston rod 5 so as to be axially slidable therein the outer end of the tappet rod projecting out of the said bore. Axial inward movement of the tappet rod 17 is utilised to move the valve to the open position such movement being effected by angular displacement of a cam lever 18 which is mounted on a pivot pin 19 at the outer end of the tubular piston rod so as to be swingable about an axis arranged at right angles to the sliding axis of the tappet rod, the outer end of the tappet rod being urged into contact with an edge of the cam lever by the action of spring 20.

Located within the annular space behind the piston 4 is an annular piston 21 which is spring loaded by compression spring 22 so as normally to be urged towards the piston 4, the annular piston being held in a limit position by the spring loading against the stop ring 9 which as above mentioned, also acts to limit the outward movement of the piston 4 in the hydraulic cylinder the width of the stop ring providing a clearance between the rear side of said piston 4 and the annular piston,

so that the radial drilling or drillings 13 are not blanked off.

With the mechanism constructed as above the arrangement is such that when the valve is in the closed position hydraulic liquid is prevented from flowing between the chamber 14 on one side of the piston and the annular space 15 on the other side of the piston whereby relative axial movement between the hydraulic cylinder and piston is prevented. When the valve 16 is moved to the open position by appropriate operation of the tappet rod 17 and cam lever 18, upon the application of an external load causing retraction of the hydraulic cylinder and piston, hydraulic liquid will flow from the chamber 14 on one side of the piston through the port 12 in the piston and radial drilling or drillings 13 in the tubular piston rod into the annular space 15 thus resulting in displacement of the annular piston 21 against its spring loading the hydraulic lock being again created when the valve is returned to the closed position whereby the hydraulic cylinder and piston are again held against relative axial movement and secured in the adjusted position. If the valve 16 is again moved to the open position and the external load removed the internal load created by the spring action on the annular piston 21 will cause displacement thereof so that the hydraulic fluid is caused to flow from the annular space 15 to the chamber 14 with the result that the hydraulic cylinder and piston are extended, to a further adjusted position in which they can be held by reclosure of the valve.

In FIGURE 3 of the drawings the hydraulic locking mechanism above described is shown incorporated in a seat, for example an aircraft passager seat denoted generally by reference numeral 23 the mechanism being arranged to secure the angularly adjustable back 24 of the seat which is pivotally mounted at 25. For this purpose the mechanism is arranged to extend between the lower end of the pivotally mounted seat back and a fixed anchorage such as the stationary set mounting 26, the coupling means 11 of the hydraulic cylinder being connected to the said lower end of the seat back at a point below the pivot 25 and the coupling means 10 of the piston to the stationary mounting. The cam lever 18 is connected through a suitable linkage, not shown, to a press button or other control member 27 mounted for example as shown on an arm rest of the seat so as to be readily accessible to the occupant of the seat. By operating the press button to open the valve and pressing on the adjustable back 24 of the seat, the seat occupant can tilt the back of the seat rearwardly to any desired angular position in which it is held upon reclosure of the valve 16 by release of the push button. To tilt the back of the seat in the opposite direction it is only necessary for the occupant to again operate the press button to open the valve 16 and remove pressure from the back of the seat to permit the spring loading on the annular piston to take effect.

In the hydraulic locking mechanism according to FIGURES 1 to 3 of the drawings the displacement of the annular piston 21 to create the internal load is effected by relative movement of the cylinder 1 and piston 4 towards the extended condition. FIGURES 4 and 5 however, show a hydraulic locking mechanism operable in the reverse sense to such first described embodiment, the creation of the internal load being obtained by relative movement of the cylinder and piston towards the contracted condition.

Thus, the locking mechanism according to the embodiment shown in FIGURES 4 and 5 of the drawings comprises a hydraulic cylinder 28 closed at one end by an end wall 29 and at the other end by a closure cap 30 screwed into a threaded portion of the cylinder bore, the end cap being locked by a locking ring 31. Disposed within the bore of the cylinder 28 is a piston 32 having a tubular piston rod 33 extending axially through the cylinder bore, the outer end of the tubular piston rod projecting into a sealing gland 34 in the closed end 29 of the cylinder. A closure plug 35 is screwed into the outer end of the tubular piston rod the closure plug projecting outwardly of the cylinder the projecting end of the same being formed to provide a shoulder 36 which contacts the opposite face of the closed end 29 of the cylinder thus limiting the axial inward movement of the piston 32 under the spring loading acting between the piston and cylinder which is provided by the compression spring 36*a*. The outwardly projecting end of the closure plug 35 and the cylinder closure cap 30 are each formed to provide coupling means denoted gennerally by the reference numerals 37 and 38 respectively through which the hydraulic locking mechanism can be attached to the members to be held in relatively adjusted positions.

The inner end of the bore of the tubular piston rod 33 communicates with a port 39 extending axially into the piston 32 the inner end of the port providing a seating for a ball 40 which is spring loaded so as to be urged onto the seating to close the port 39, by a compression spring 41 acting between the ball valve retainer 42 and a spring retaining cup 43 in the valve chamber 44 provided in the piston 32 coaxially with the port 39. The spring retaining cup is secured against axial displacement by a transverse pin 45. The ball 40 controls the passage of hydraulic liquid between the cylinder space 46 on one side of piston 32 and the cylinder space 47 on the other side of the piston, the valve chamber 44 being in communication with the cylinder space 46 through a passage or passages 48 in the piston whilst the bore of the tubular piston rod is in communication with the cylinder space 47 through a passage or passages 49 in the piston.

The ball 40 is moved away from its seating to open the port 39 by effecting axial movement of a tappet rod 50 extending through the tubular piston rod 33. The inner end of the tappet rod is disposed adjacent the ball, the tappet rod passing through a sealing gland 51 in the bore of the tubular piston rod and through a bore in the closure plug 35, the outer end of the tappet rod projecting out of the closure plug so as to be in contact with an edge of a cam lever 52 pivotally mounted on a pivot pin 53 carried by the closure plug so as to be capable of swinging movement about an axis at right angles to the axis of the tappet rod. By turning the cam lever in the clockwise direction, FIGURE 4, the tappet rod is moved axially inwardly whereby the ball 40 is displaced from its seating to open the port 39 so that the cylinder spaces 46 and 47 are open to one another, return movement of the cam lever permitting the ball 40 to reseat under the action of the compression spring 41.

Disposed within the cylinder space 47 is a second piston 54 which is urged by spring 55 towards the piston 32 and the arrangement is such that when the ball 40 is seated hydraulic liquid is prevented from flowing between the cylinder spaces 46 and 47 whereby relative axial movement between the cylinder 28 and piston 32 is prevented. When the ball 40 is unseated by appropriate operation of the tappet rod 50 and cam lever 52, upon the application of an external load causing extension of the piston 32 and cylinder 28, hydraulic liquid displaced by the piston will flow from the cylinder space 46 to the cylinder space 47 through the passage or passages 48, valve chamber 44, port 39 and passage or passages 49. The second piston 54 is therefore displaced by its spring loading against the fluid in cylinder space 47 with the hydraulic lock being again created when the ball 40 is reseated so that the hyraulic cylinder and piston are again held against relative axial movement and secured in the adjusted position. If the ball 40 is again unseated and the external load removed, the internal load created by the spring action on the second

piston 54 will cause displacement thereof so that reverse flow of the hydraulic liquid takes place with the result that the hydraulic cylinder and piston retract to a further adjusted position in which they can be held by reseating of the valve.

FIGURE 6 of the drawings shows the mechanism of FIGURE 4 incorporated in a seat 23 of the kind disclosed in connection with FIGURE 3, like references being used in the two figures to denote corresponding parts. As shown in FIGURE 6, the mechanism is installed by connecting the coupling 38 to the pivotally mounted seat back at a point above the pivotal mounting 25, the coupling means 37 being pivotally connected to the static mounting 26 of the seat. The cam lever 52 is connected through a suitable linkage, not shown, to the press button or other control member 27 and angular adjustment of the seat back 24 by the occupant of the seat is effected as already described above.

FIGURES 7 and 8 of the accompanying drawings disclose a mechanism which is primarily intended for use with the seats of road vehicles. In addition to the function of providing for locking the seat back in any adjusted position, the mechanism also permits pivotal movement of the seat back from any adjusted position so that a seat occupant wearing a safety harness attached to the seat can lean forwards, the seat back being returnable to a previously adjusted angular position without the necessity of effecting readjustment. In addition the mechanism is adapted so that the same can function as a shock absorber to provide damping to the pivotal movement of the seat back which could result from heavy impacts to which the vehicle may be subjected, for example under crash conditions, the damping reducing the possibility of injury to the seat occupant particularly if wearing a safety harness. This feature of the mechanism is advantageous as it has been found that spinal injury can be suffered by a seat occupant wearing a safety harness due to seat recoil after a heavy impact.

Referring to the drawings, the mechanism shown in FIGURES 7 and 8 comprises a hydraulic cylinder 56 closed at one end by an end wall 57 and at the other end by a closure plug 58 secured axially in the cylinder bore by a spring retaining ring 59. The hydraulic cylinder 56 is slidably disposed within a casing 60 having an annular end wall 61 at on end which is provided with a tubular extension 62 the opposite or open end of the casing having an external flange 63. The hydraulic cylinder 56 contains a piston 64 having a tubular piston rod 65 which extends through the cylinder and the end closure plug 58 thereof. The outer end of the tubular piston rod projects outwardly through the tubular extension 62 of the casing 60, and has a flanged bush 66 axially secured thereon by a spring retaining ring 67. A compression spring 68 extends between the flange of bush 66 and the flange 63 of the casing 60. The end wall 57 of the hydraulic cylinder and the flanged bush 66 on the tubular piston rod are each formed to provide coupling means denoted generally by reference numerals 69 and 70 respectively and by means of which the mechanism can be installed in position.

The bore of the tubular piston rod has an annular bush 71 having a port 72 in one end thereof one end of the port forming a seating for a ball valve 73 disposed in a valve chamber 74 extending through the piston 64 coaxially with the port 72. The ball is urged by a spring 75 onto the seating to close the port 72, the spring extending between a ball retainer 76 and a stop 77 in the valve chamber and positioned adjacent the outer open end of the valve chamber. The ball valve 73 controls the passage of hydraulic liquid between the cylinder space 78 on one side of the piston and the cylinder space 79 on the other side of the piston a radial drilling or drillings 80 through the wall of the tubular piston rod and annular bush 71 being provided for the flow of the hydraulic liquid.

The ball valve 73 is unseated against the action of spring 75 by effecting inward axial movement of a tappet rod 81 which extends axially through the bore of the tubular piston rod 65 the inner end of the rod passing through a sealing gland 82 in the annular bush 71. The outer end of the tappet rod 81 projects beyond the outer face of the flanged bush 66 and is in contact with an edge of a cam lever 83 mounted on a pivot pin 84 carried by the coupling means 69 the pivot pin being arranged so that the cam lever 83 is swingable about an axis at right angles to the movement of the tappet rod 81. The arrangement is such that by swinging the cam lever 83 in an anticlockwise direction (FIGURE 7), the tappet rod 81 is moved inwardly so that the ball valve is unseated against the action of spring 75 thus placing the chambers 78, 79 in communication with one another to permit relative axial movement between the cylinder and piston, the two being held in any adjusted position when the hydraulic lock is re-established by reclosure of the ball valve 73.

As above stated the mechanism of the present embodiment is adapted for operation as a shock absorber for which purpose the end closure plug 58 has a passage 85 extending axially therethrough and through which hydraulic liquid can flow from the cylinder space 79 into the annular space 86 between the end of the hydraulic cylinder and the end wall of the casing 60. The flow of hydraulic liquid through the passage 85 is controlled by a ball valve 87 which provides a closure member for the passage 85. The ball valve is accommodated in a counterbore 88 in the inner end of the passage 85, the ball valve being spring loaded by a compression spring 89 which acts to urge the ball valve to the unseated position so that the spaces 79 and 86 are normally open to one another through the passage 85. The ball valve is supported against the spring action by a stop pin 90 which thus holds the ball valve in a limit position when unseated.

FIGURES 9 to 14 of the accompanying drawings show the mechanism of the present embodiment installed in a road vehicle seat denoted generally by reference numeral 91, the seat having an adjustable seat back 92 pivotally connected as at 93 to the seat portion 94. The mechanism is installed by pivotally connecting the coupling means 70 to the lower end of a bracket 95 extending downwardly from the seat back 92, the other coupling means 69 being pivotally connected to a static member provided by a bracket 96 extending downwardly from the underside of the seat portion 94.

FIGURES 9 and 10 of the accompanying drawings indicate the operation of the mechanism when effecting angular adjustment of the seat back 92. When the seat back 92 is in the vertical position shown in FIGURE 9B, the hydraulic cylinder and piston are fully extended as shown in FIGURE 9A, the ball valve 73 having been unseated by appropriate operation of the tappet rod 81 and cam lever 83 by the seat occupant through a remote control operated by for example a press button or other means disposed for operation by the occupant of the seat. To incline the seat back from the vertical position of FIGURE 9B to for example, the position shown in FIGURE 10B, the ball valve 73 is unseated by appropriate operation of the remote control by the seat occupant and the seat back is pressed rearwardly until it reaches the desired angular position whereupon the ball valve is allowed to reseat to establish the hydraulic lock and hold the seat back in the angularly adjusted position by preventing further relative axial movement between the hydraulic cylinder and piston. During this adjustment of the seat back, the hydraulic cylinder and piston move axially relative to one another towards the retracted position, hydraulic fluid passes from one side of the piston to the other between the cylinder spaces 78 and 79 and the spring 75 is compressed, the mechanism then being in the position indicated in FIGURE 10B. If it is desired

to re-adjust the seat back by reducing the incline it is only necessary to unseat the ball valve 73, whereby the load created in the compression spring 75 will operate to effect the required relative axial movement between the hydraulic cylinder and piston in the direction corresponding to extension thereof, the ball valve being reseated when the desired angular position is attained. In moving the seat back, due to the difference in areas of the two sides of the piston 64 different volumes of hydraulic liquid will be displaced. Thus there will be an excess of liquid in one direction which will flow through the ball valve 87 into the space 86.

If the seat occupant is wearing a safety harness as shown diagrammatically in FIGURE 11B, the mechanism permits the seat occupant to lean forwards without the necessity of disturbing the angularly adjusted position of the seat back so that when moving back from the forward position the seat back is in the previously adjusted angular position. Assuming that the seat occupant wishes to lean forward from the reclining position shown in FIGURE 11B to the vertical position shown in FIGURE 12B, the seat back will follow the movement of the seat occupant through the safety harness as the seat occupant sits upright. To assume the reclining position the seat occupant merely leans back so that the seat back is pressed rearwardly and stops automatically in the previously adjusted angular position. The ball valve 73 is not operated during these movements. The action is as follows: As the seat back is pulled forward, the piston 64 transfers hydraulic liquid from the cylinder space 79 to the space 86, through the passage 85. The ball valve 87 remains open since the pressure generated is insufficient to overcome the action of the valve spring 89. As the ball valve 73 is closed so that hydraulic liquid cannot pass between cylinder spaces 78 and 79, the hydraulic liquid in cylinder space 78 will cavitate and a vacuum is produced in this space. On reverse movement of the seat back, i.e., when the seat occupant returns to the reclining position, the piston will come to rest when it makes contact with the hydraulic liquid that is to say when it reaches its axial position corresponding to the previously adjusted inclined position of the seat back. The condition of the mechanism during these movements is shown in FIGURES 11A and 12A of the drawings.

The function of the mechanism under heavy impact or "crash" conditions to which the vehicle might be subjected is disclosed in connection with FIGURES 13 and 14 of the accompanying drawings. The shock absorbing action of the mechanism in conjunction with a safety harness worn by the seat occupant as shown diagrammatically in FIGURE 13B provides a greater degree of safety than with a safety harness alone. Assuming the seat occupant to be in a reclining position as shown for example in FIGURE 11B, in the event of a crash, the seat occupant and seat back tend to move rapidly forwards to the position shown for example in FIGURE 13B. This movement generates a high impact pressure in the cylinder space 79 which seats ball valve 87 and unseats ball valve 73 thus allowing a controlled rate of flow of hydraulic liquid from cylinder space 79 to cylinder space 78. As a result the piston moves slowly outwards in the hydraulic cylinder and in so doing absorbs the shock. Due to the resilient nature of the safety harness and parts of the seat back, immediately after the initial impact there is a recoil condition where both the seat occupant and seat back are thrown backwards. When this occurs pressure is generated in cylinder space 78 which is sufficient to reseat ball valve 73, ball valve 87 unseating. The reseating of ball valve 73 results in the production of the hydraulic lock whereby the seat back is held in position and provides a support for the seat occupant. FIGURES 13A and 14A show the condition of the mechanism under the above described crash conditions.

With the arrangements above described to return the mechanism to the normal position from the fully adjusted position it is necessary to unseat the control valve by actuation of the operator control to release the hydraulic lock. However the mechanism can be modified so that the operator control can be overriden to permit the mechanism to be returned rapidly to the normal condition from the fully adjusted position. This modification is advantageous for example when the mechanism is incorporated in adjustable seats as above described.

As shown for example in FIGURE 15, which is a modification of the mechanism shown in FIGURE 1, immediately behind the valve head 16 the tappet rod 17 is drilled to receive a diametral pin 117 the opposite ends of which project outwardly from the tappet rod so as to be engageable with a stop provided by an annular member 118 supported against the spring retaining ring 9 on the side opposite to the floating piston 21, slots 119 being provided in the tubular piston rod 5 to permit the axial movement thereof. The arrangement is such that when the mechanism is in the fully adjusted position by effecting appropriate relative movement between the piston and cylinder of the mechanism, the pin 117 can be caused to contact the stop provided by the annular member 118 whereby the valve 16 is unseated. This allows fluid from the chamber 15 to flow rapidly back into chamber 14 because of the cavitation which has occurred in chamber 14 during extension of the mechanism by the external load.

FIGURE 16 shows a modification to the mechanism of FIGURE 4 which also provides for overriding the operator control. In this modified construction, the floating piston is annular and is mounted around a sleeve 120 the inner end of the sleeve being coupled by a diametral pin 121 to the central spigot portion projecting outwardly from the piston 32 so that the sleeve 120 and piston 32 are movable jointly. With this modification the mechanism has equal displacement on both sides of the piston 32 so that the application of a compression load to the mechanism to return the same from an adjusted position to the normal position results in the rapid build up of pressure in the chamber 47 the spring 55 being highly rated. This pressure overcomes the spring loading of the ball valve 40 so that the same is unseated permitting the rapid transference of fluid from one side of piston 32 to the other.

We claim:

A hydraulic locking mechanism for a seat and the like comprising a cylinder with a first piston therein having a hollow piston rod extending out one end of the cylinder, port means in said first piston for permitting liquid to flow from one side of said first piston to its opposite side including an axial passage forming a valve seat, a valve for seating on said valve seat to close off said axial passage, a passage in said piston in communication with one side of said first piston and one side of said valve, and a second passage in communication with the opposite side of said first piston and in communication with the interior of said hollow piston rod and the oposite side of said valve, a valve disposed to seat on said valve seat to close off said axial passage, a first piston spring means disposed in said cylinder adjacent said one end normally urging said first piston toward the opposite end of said cylinder so said piston rod is in a retracted position with respect to said cylinder, a second piston in said cylinder disposed adjacent the side of said first piston opposite said piston rod, a second piston spring means normally urging said second piston in a direction toward said first piston, a tappet member extending through said hollow piston rod and out said one end of the cylinder, said tappet member having its inner end adapted to manually open said valve to permit liquid to flow through said axial passage to the spaces in the cylinder on opposite sides of the first piston, said valve being constructed to be opened by said tappet member, and a cam lever outside said cylinder operatively connected to said tappet member to move said tappet member axially of said cylinder to

open said valve, and coupling means for connecting said mechanism to a seat.

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