Jan. 6, 1953 C. F. CARAMELLI 2,624,566

ADJUSTABLE COUNTERSEAT

Filed March 25, 1949 2 SHEETS--SHEET 1

FIG. 1.

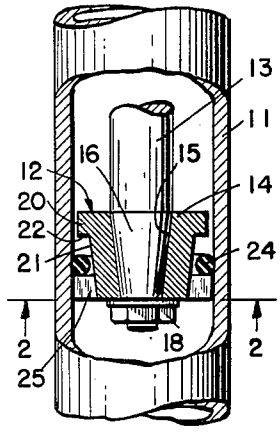


FIG. 2.

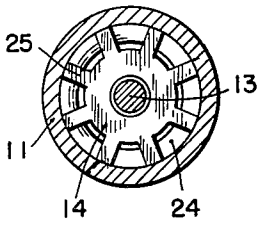


FIG. 8.

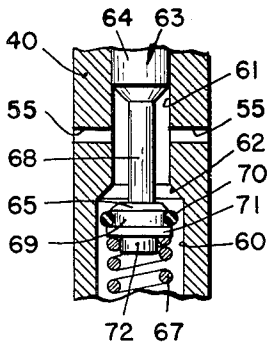


FIG. 3.

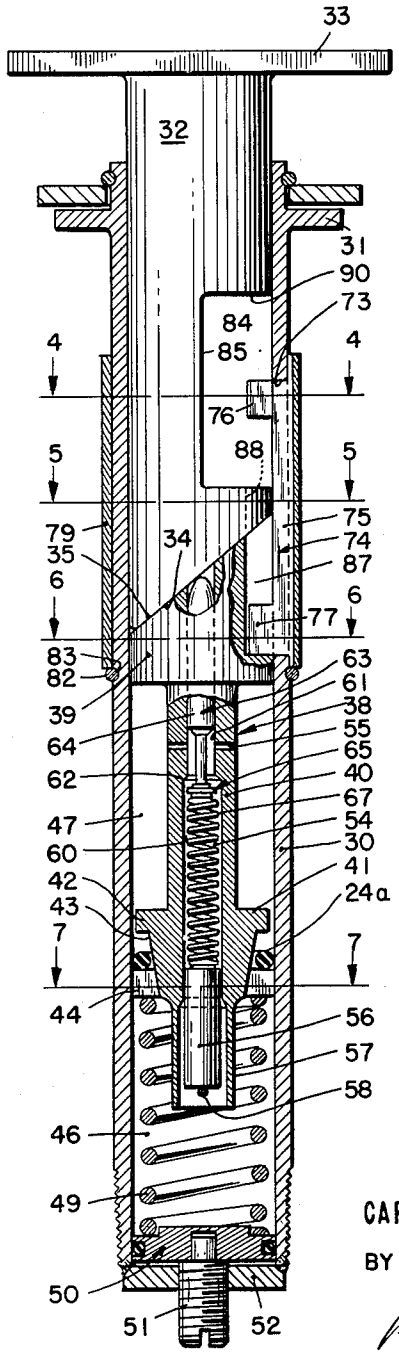


FIG. 4.

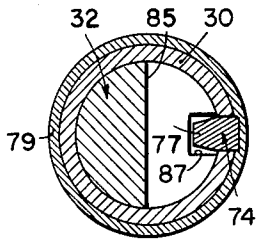


FIG. 5.

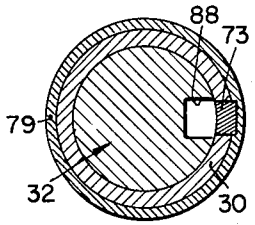


FIG. 6.

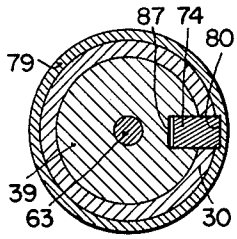
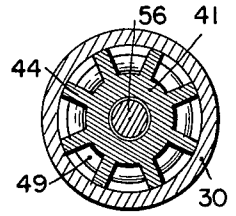


FIG. 7.



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ADJUSTABLE COUNTERSEAT

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FIG. 9.

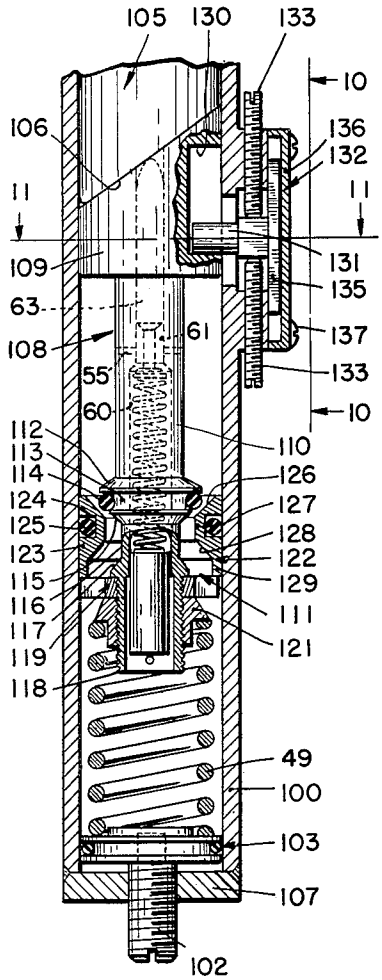


FIG. 10.

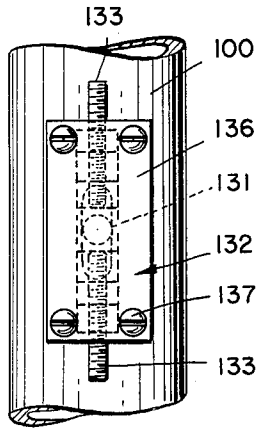


FIG. 11.

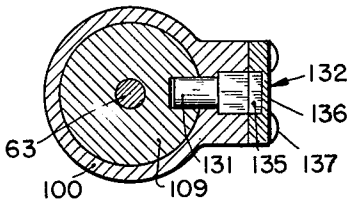
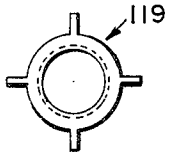


FIG. 12.



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UNITED STATES PATENT OFFICE

2,624,566

ADJUSTABLE COUNTERSEAT

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Application March 25, 1949, Serial No. 83,310

6 Claims. (Cl. 267—1)

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This invention has to do generally with hydraulic apparatus and fluid motors and pumps. More particularly, the invention relates to a piston construction embodying an annular sealing member floatingly disposed in such a manner that it serves both as a sealing means and as a quick-opening valve.

A further object of the invention is to provide a new and improved hydraulic unit embodying a piston of the type previously indicated which is suitable for use as a delayed action mechanism in adjustable counterseats of the type set forth in my copending application for patent Serial No. 53,923 for Sliding Counterseat.

A still further object is to provide a new and improved hydraulic delayed action mechanism for adjustable counterseats which embodies improved means for controlling the rotation of the seat.

Another object is to provide a hydraulic unit for controlling adjustable counterseats in which improved means are provided for adjustably limiting the amount of movement of the device.

These and other objects will be apparent from the drawing and the following description thereof.

Referring to the drawings, which are merely for illustrative purposes:

Fig. 1 is a fragmentary view in section of a piston and cylinder showing a piston embodying the invention;

Fig. 2 is a section on line 2—2 of Fig. 1;

Fig. 3 is a longitudinal sectional view of a hydraulic unit designed for adjustable counterstools or seats;

Figs. 4, 5, 6, and 7 are sectional views on the lines 4—4, 5—5, 6—6, and 7—7, respectively of Fig. 3;

Fig. 8 is an enlarged sectional detail of the control valve of Fig. 3;

Fig. 9 is a fragmentary longitudinal sectional view of a modified form of hydraulic unit of the general type shown in Fig. 3;

Fig. 10 is an elevational view on line 10—10 of Fig. 9;

Fig. 11 is a section on line 11—11 of Fig. 9; and

Fig. 12 is a plan view of the valve seat support.

As previously indicated, in its broader aspects the invention is concerned with the provision of a special type of piston, and this has been shown in Figs. 1 and 2. Referring to these figures, reference numeral 11 indicates a cylindrical body which has been shown fragmentarily. This may be the cylinder of a pump or fluid motor. Mounted for reciprocation in the cylinder is a piston

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generally designated by 12 on a piston rod 13. The piston 12 includes a body 14 which has a tapered interior seat or bore 15 adapted to seat on a frustro-conical section 16 of the piston rod 13. The outer end of the rod may be threaded to receive a nut 18 for retaining the piston on the rod.

The piston body 14 includes an enlarged or flanged portion 20 which is shown as cylindrical at its periphery. The diameter of this portion is considerably less than the inner diameter of the cylinder 11 so as to provide clearance for the flow of liquid therepast.

The body 14 is also provided with a tapered or frustro-conical section 21 which is of greatest diameter adjacent the flanged portion 20. An annular wall or shoulder 22 separates the tapered section 21 from the periphery of the flange or enlarged portion 20 of the body of the piston.

The piston is provided with a combination seal ring and quick-opening valve member, indicated by 24. This member is made of suitable resilient or rubber-like material and is in the form of what is known in the art as an O ring, that is, it is circular in cross section. The outer diameter of the ring 24 is preferably substantially the same as the inner diameter of the cylinder, being larger than the diameter of the flanged portion 20.

Means are provided on the end of the piston body 14 opposite the enlarged end 20 for retaining the sealing ring on the piston and such means may take the form of an interrupted or slotted flange 25.

In the operation of the piston, when the piston is moving downwardly in Fig. 1, the seal ring 24 moves upwardly on the piston until it lodges against the shoulder 22 and the immediately adjacent portion of the tapered section 21. In this position the ring effectively seals the piston against escape of fluid upwardly therepast.

When the piston is moved in the opposite direction, the seal ring quickly assumes the position in which it is shown in the drawing, permitting bypass of fluid past the piston and the ring. In this and the previous illustration it has been assumed that the piston rod 13 is moved by some outside motive force. It will be apparent, however, that the device may be equally operable as a fluid motor in which case the fluid would propel the piston.

In Figs. 3–8 there is shown an embodiment of the invention which is designed for use in connection with adjustable counter stools or seats, such as set forth in my copending application referred to above. In such devices the appara-

tus shown in Fig. 3 is received within a supporting column (not shown) or the standard of tubular construction, and the device is designed for delaying downward movement of the seat until proper adjustments thereto have been made. Other means are provided for locking the seat after it has been adjusted and after the device herein shown has permitted the seat to descend. The mechanism shown in Figs. 3–8 may be described as a hydraulic unit for supporting and controlling movement of the counterseat. It includes a cylindrical housing or cylinder 30 which fits within the tubular supporting column referred to which supports the seat, being provided with an external flange 31 at its outer end for the purpose of anchoring it in the column in any suitable manner. The cylinder 30 receives the mounting pin 32 which has a flange 33 at its upper end for mounting the counterseat or stool. The lower end of the pin 32 terminates in an inclined cam face 34 which rests upon a similar face 35 on the upper end of a piston mechanism generally indicated by numeral 38.

The piston mechanism comprises an upper guide body portion 39 which is slidably received in the cylinder 30 and against which the mounting pin 32 rests. The piston mechanism also has a central or intermediate connecting section 40 which terminates in a piston body 41. The piston body 41 is generally similar exteriorly to the piston body 14 previously described in that it has an enlarged or flanged section 42 at its upper end, a central tapered section 43, an interrupted seal ring retaining means 44, and a seal ring 24*a*. The seal ring 24*a* operates on the piston in the same manner as on the piston previously described.

Since it is the purpose of the device shown in Fig. 3 to provide for the gradual descent of the load on it under certain conditions, the piston mechanism 38 is provided with means for gradually bypassing liquid from a lower chamber 46 below the piston body to an upper chamber 47 above it. In addition, means are provided for yieldably holding the piston mechanism 38 and its associated elements upwardly in the position in which it is shown in the drawing. This means takes the form of a coil spring 49 which is interposed between the piston body and a spring supporting disk 50 mounted on an adjustment bolt 51 in the lower end wall 52 of the cylinder 30.

The means for gradually bypassing fluid past the piston body comprises a passage 54 which extends through the piston and piston mechanism generally. This connects with the chamber 47 by one or more ports 55. Disposed in the passage 54 is a metering pin 56 which is housed within a tubular elongation 57 on the piston and held in place by supporting pin 58. The metering pin 56 is of sufficiently less diameter than the bore forming the passage 54 through the piston to permit passage of fluid past the pin. Passageway 54 includes a large bore 60 and a counterbore 61 between which is a valve seat 62. A valve 63 is provided, and this includes an actuating rod 64 in the counterbore and a valve element 65 in the large bore 60. A spring 67 serves to yieldably hold the valve closed. The valve element 65 (Fig. 8) includes a stem 68, and a head 69 provided with an O ring 70 above a flange 71. A stud 72 is formed on the lower end of the valve element, and the spring 67 fits around this.

It will be apparent that the valve 63 is held closed except when it is pushed open by contact of the lower end surface 34 on the mounting pin 32 with the upper end of the rod 64.

In order to provide for limiting the travel of the mounting pin 32 and the piston mechanism 38 the cylinder 30 is provided with a longitudinally extending slot 73. Mounted in the slot is a stop member 74 which comprises an elongated bar section 75 provided with an upper stop projection 76 and a lower one 77. The stop 75 is preferably held in place by means of a sleeve 79 which, if desired, may be provided with a longitudinal groove 80 for receiving the same. A split ring 82 mounted in a groove 83 on the cylinder 30 serves to hold the sleeve in position.

The mounting pin is provided with a notch or cutout 84 in the region of the upper stop 76, and by reason of this construction the mounting pin 32 may pivot substantially through 90°, being limited in its pivotal movement only by contact of the wall 85 with the upper stop projection 76.

The lower stop 77 is received in a longitudinal slot 87 in the member 39. The mounting pin is also slotted at 88 to receive the lower stop 77 when the mounting pin is in its lower most position and to permit removal of the pin past upper stop 76.

It will be apparent from the above description that when a load is imposed upon the mounting pin 32 the device will gradually give way, assuming that the parts are in the position shown, that is, the two inclined faces 34 and 35 on the pin and piston mechanism are in the same plane. If the mounting pin is rotated with relation to the piston mechanism 38 so that the faces 34 and 35 are not in the same plane, valve member 63 will rise, closing the passage 54 preventing escape of liquid from the lower chamber 46 to the upper chamber 47. Assuming the parts are in the position shown, fluid in the chamber 46 passes upwardly past the metering pin 56 through passage 54 and out ports 55 into chamber 47, thereby permitting gradual descent of piston mechanism 38 and mounting pin 32.

Downward travel of the parts is limited by the upper stop member 76 which is abutted by the wall 90 of the cutout 84 in the pin. It may also be pointed out that when the pin 32 is in lowered position and is properly oriented the lower stop 77 is received in the slot 88, preventing rotation of the mounting pin 32. It will be apparent, of course, that the parts are returned to their original position once the load on the device is removed by the spring 49. During the return movement the seal ring 24*a* assumes the position that it occupies in Fig. 1 and the liquid above the piston can rapidly escape past the piston.

In Figs. 9–12 there is shown a modified form of the invention wherein adjustable means are provided for limiting the travel of the movable parts and wherein a different type of piston and seal ring construction is provided .

Referring to these figures, a cylinder 100 is provided which is closed at its lower end by a wall 107 through which extends an adjustment bolt 102, on the inner end of which is a spring disk support 103. Slidable in the cylinder is a mounting pin indicated by 105 and merely fragmentarily shown. The pin may be considered as solid above the fragment shown and terminates in an angular or inclined lower face 106 similar to the face 34 on pin 32.

Below the mounting pin and arranged for slid-

ing movement in the cylinder 100 is a piston mechanism generally indicated by numeral 108. This mechanism includes an upper end portion 109 which makes a sliding fit with the inner wall of the cylinder. It also includes a central elongated tubular section 110 and a piston section 111 at its lower end. The interior of the section 110 is the same as the interior of the section 40 of the device previously described, and it houses the same type of valve 63 and includes the same bore and counterbore 61 of the other device. It also includes ports 55.

However, the piston end 111 differs from that previously described. The piston comprises an enlarged end section 112 which is provided with an annular groove 113 for the reception of a flexible or resilient seal ring 114. Below this the piston body is tapered section 115, a straight section 116, an outwardly tapered section 117. A piston body terminates in a threaded tube 118 which accommodates a seal retaining element 119 which is more clearly shown in Fig. 12. Also mounted on the part 118 is a spring seat 121 and between this and the spring disk 103 there is provided a spring 49.

A floating sealing sleeve, generally indicated by 122, is provided surrounding the piston. This comprises a metal body 123 which makes a sliding fit with the cylinder wall and may contain a groove 124 holding a packing ring 125 of any suitable type. The inner surface of the ring generally conforms to the outer surface of the piston. At its upper end the sleeve has a frusto-conical surface 126 which is disposed generally opposite the O ring 114 on the piston. Below this is a cylindrical section 127, an outwardly tapered section 128, and a short cylindrical end 129. The lower end bears upon the retaining member 119.

In the operation of the device the surface 126 of sealing sleeve is adapted to make sealing engagement with the seal ring 114 on the piston when the piston moves downwardly. The parts are shown with the valve ring in the open position, and it will be apparent that when the piston moves upwardly the sealing sleeve ring will quickly assume this position to permit bypass of fluid past the piston.

In order to limit travel of the piston, the upper end portion 109 is provided with a longitudinal slot 130 which receives a stop pin 131. The stop pin is mounted in a housing 132 which supports a pair of adjustment screws 133 which extend longitudinally of the cylinder and which have their inner ends adapted to bear against the pin 131. The pin 131 is mounted on a plate or base 135, and this is enclosed by cover plate 136 secured by screws 137 by adjustment of the screws 133. The pin 131 may be moved upwardly or downwardly a limited extent and thereby predetermine the limit of travel in upward and lower positions of the piston mechanism.

The operation of the mechanism shown in Figs. 9–12 is substantially the same as that of the mechanism shown in Figs. 3–8 insofar as the piston mechanism is concerned except for the fact that the means for limiting travel of the piston mechanism differs as described above.

Although the invention has been particularly shown and described, it is contemplated that various changes and modifications can be made without departing from the scope of the invention as set forth in the claims.

I claim:

1. A hydraulic control unit comprising a cylinder adapted to be supported in upright position, said cylinder being closed at its lower end and open at its upper end, a piston mechanism in said cylinder including an enlarged guide body at its upper end adapted for sliding movement in the cylinder, a piston body spaced below the guide body, and an intermediate connecting section of smaller diameter, said piston mechanism dividing said cylinder into an upper fluid chamber above the piston body and a lower fluid chamber below the piston body, valve controlled passage means for permitting limited flow of fluid through said piston from said lower chamber to said upper chamber and for permitting gradual downward movement of the piston mechanism in said cylinder, said piston body having means to bypass fluid upon upward movement thereof, spring means between the cylinder and said piston mechanism for yieldably holding up said piston mechanism, a mounting pin extending into the upper end of said cylinder for sliding and rotative movement therein, said pin bearing upon the guide body portion of said piston mechanism, and interengaging means on said cylinder and said piston mechanism preventing relative rotation thereof.

2. A hydraulic control unit comprising a cylinder adapted to be supported in upright position, said cylinder being closed at its lower end and open at its upper end, a piston mechanism in said cylinder including an enlarged guide body at its upper end adapted for sliding movement in the cylinder, a piston body spaced below the guide body, and an intermediate connecting section of smaller diameter, said piston mechanism dividing said cylinder into an upper fluid chamber above the piston body and a lower fluid chamber below the piston body, valve controlled passage means for permitting limited flow of fluid through said piston from said lower chamber to said upper chamber and permit gradual downward movement of the piston mechanism in said cylinder, said piston body having means to bypass fluid upon upward movement thereof, spring means between the cylinder and said piston mechanism for yieldably holding up said piston mechanism, a mounting pin extending into the upper end of said cylinder for sliding and rotative movement therein, said pin bearing upon the guide body portion of said piston mechanism, interengaging means on said cylinder and said piston mechanism preventing relative rotation thereof, the valve of said valve controlled passage means including an actuating rod projecting through the guide portion of said piston mechanism in position to be engaged by the lower end of said mounting pin when the pin and guide portion are oriented in a given manner.

3. A hydraulic control unit comprising a cylinder adapted to be supported in upright position, said cylinder being closed at its lower end and open at its upper end, a piston mechanism in said cylinder including an enlarged guide body at its upper end adapted for sliding movement in the cylinder, a piston body spaced below the guide body, and an intermediate connecting section of small diameter, said piston mechanism dividing said cylinder into an upper fluid chamber above the piston body and a lower fluid chamber below the piston body, valve controlled passage means for permitting limited flow of fluid through said piston from said lower chamber to said upper chamber and permit gradual downward movement of the piston mechanism in said cylinder, said piston body having means to bypass fluid upon upward movement thereof, spring

means between the cylinder and said piston mechanism for yieldably holding up said piston mechanism, a mounting pin extending into the upper end of said cylinder for sliding and rotative movement therein, said pin bearing upon the guide body portion of said piston mechanism, and interengaging means on said cylinder and said piston mechanism preventing relative rotation thereof, the lower end of said mounting pin and the upper end of said guide having inclined faces adapted to meet substantially throughout their areas in a given relative position of said pin and guide, the valve of said valve-controlled passage means including an actuating rod projecting through the guide portion of said piston mechanism in position to be engaged by the lower end of said mounting pin when the pin and guide portion are oriented in a given manner.

4. A hydraulic control unit comprising a cylinder adapted to be supported in upright position, said cylinder being closed at its lower end and open at its upper end, a piston mechanism in said cylinder including an enlarged guide body at its upper end adapted for sliding movement in the cylinder, a piston body spaced below the guide body and an intermediate connecting section of smaller diameter, said piston mechanism dividing said cylinder into an upper fluid chamber above the piston body and a lower fluid chamber below the piston body, valve-controlled passage means for permitting limited flow of fluid through said piston from said lower chamber to said upper chamber to allow gradual downward movement of the piston mechanism in said cylinder, said piston body having means to bypass fluid upon upward movement thereof, spring means between the cylinder and said piston mechanism for yieldably holding up said piston mechanism, a mounting pin extending into the upper end of said cylinder for sliding and rotative movement therein, said pin bearing upon the guide body portion of said piston mechanism, interengaging means on said cylinder and said piston mechanism preventing relative rotation thereof, and means for limiting rotative movement and longitudinal movement of said pin.

5. A hydraulic control unit comprising a cylinder adapted to be supported in upright position, said cylinder being closed at its lower end and open at its upper end, a mounting pin slidably and rotatively received in said cylinder, means between the inner end of said mounting pin and the closed end of said cylinder for controllably resisting movement of said pin toward the closed end of said cylinder, said means including a body of hydraulic fluid and a piston mechanism, a stop member mounted on said

cylinder and projecting inwardly thereof, said mounting pin having a cut-out portion to receive said stop member, said cut-out being considerably larger axially and laterally than said stop member whereby limited movement of said pin rotatively and axially is permitted.

6. A hydraulic control unit comprising a cylinder adapted to be supported in upright position, said cylinder being closed at its lower end and open at its upper end, a piston mechanism in said cylinder including an enlarged guide body at its upper end adapted for sliding movement in the cylinder, a piston body spaced below the guide body and an intermediate connecting section of smaller diameter, said piston mechanism dividing said cylinder into an upper fluid chamber above the piston body and a lower fluid chamber below the piston body, interengaging means on said piston mechanism and said cylinder for preventing relative rotation of said piston mechanism and said cylinder, a mounting pin slidably and rotatively mounted in the upper end of said cylinder, the lower end of said pin and the upper end of said guide body having correspondingly inclined abutting faces, said piston mechanism having a fluid passage therethrough from the lower end of said piston body communicating with the exterior of said intermediate connecting section, spring means between said piston mechanism and said cylinder yieldably urging said piston mechanism upwardly, and a valve controlling said passage, said valve having a stem extending through said guide body and projecting thereabove for engagement by the lower end of said mounting pin.

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