Dec. 18, 1962 H. D. ROBERTS 3,069,124

ADJUSTABLE CHAIR ASSEMBLY

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Fig. 3

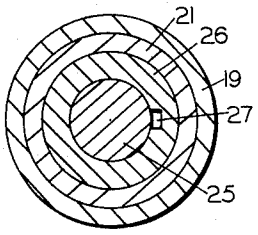
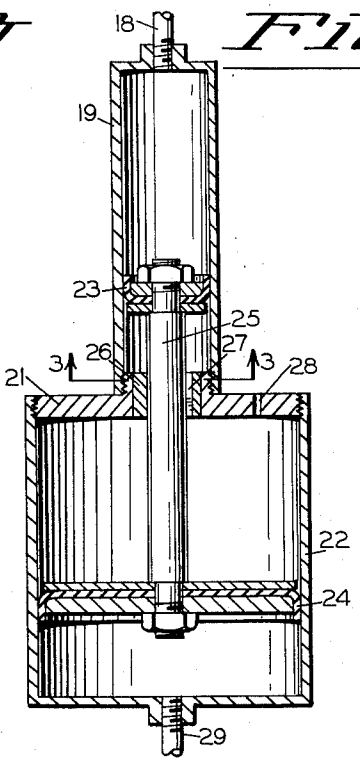


Fig. 2



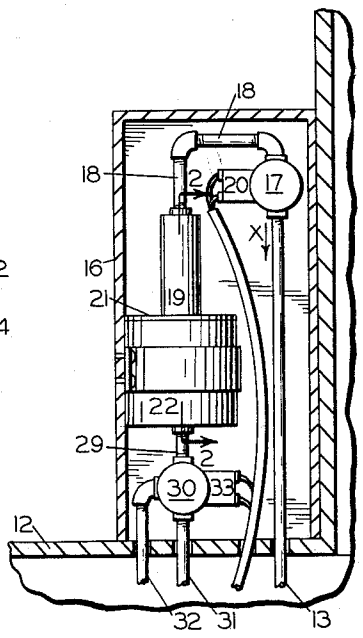


Fig. 1B

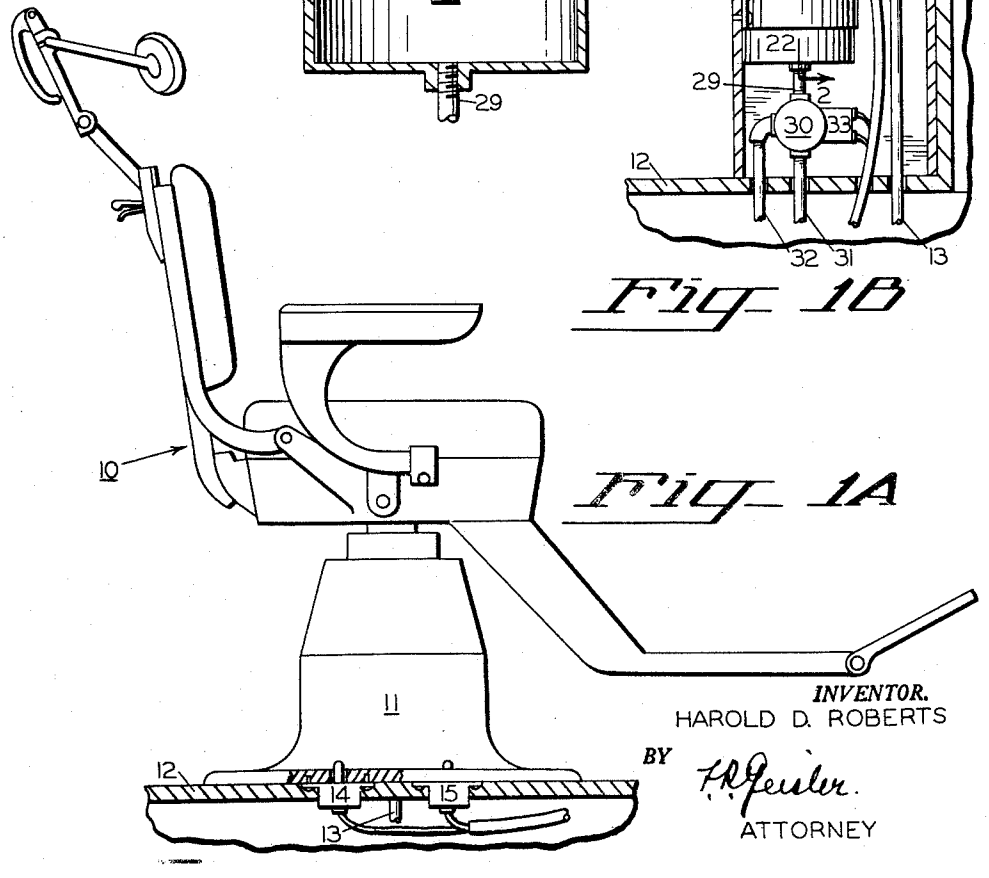


Fig. 1A

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Fig 4

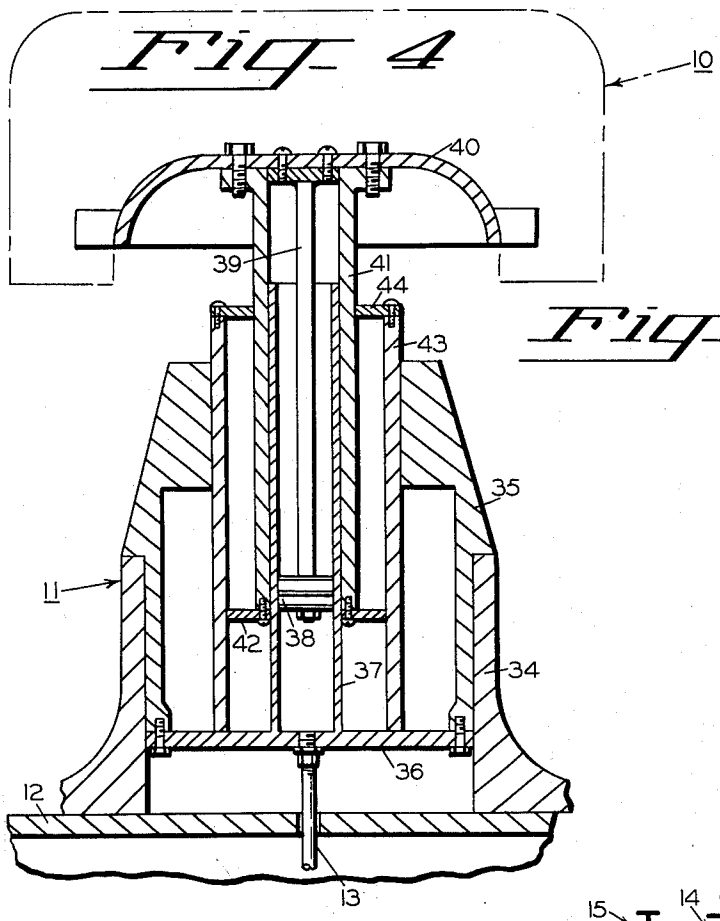
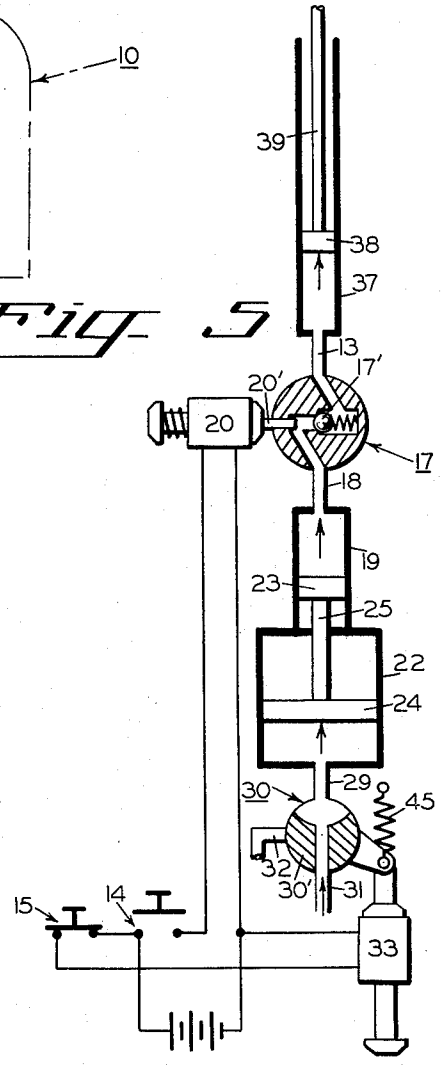


Fig 5



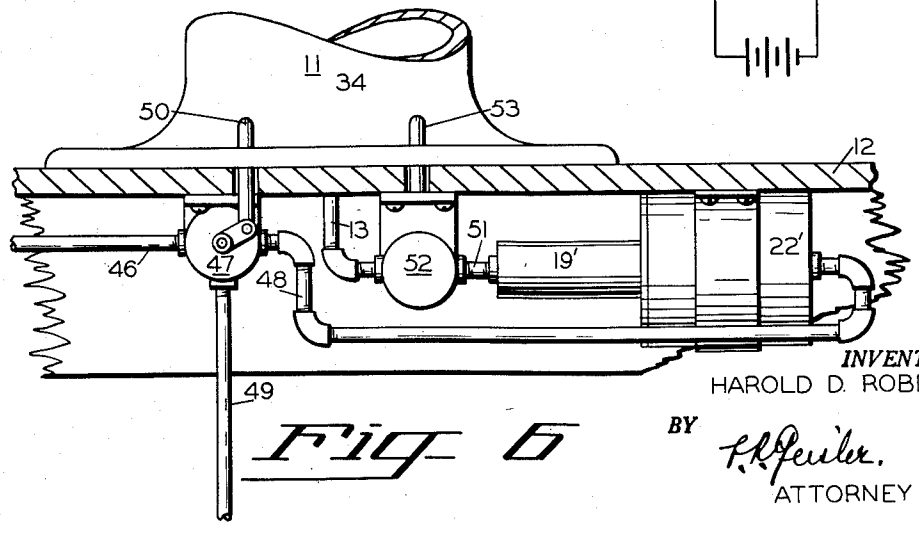


Fig 6

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ADJUSTABLE CHAIR ASSEMBLY

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1 Claim. (Cl. 248—404)

The present invention, like that described in my U.S. application for patent Serial No. 16,432, filed under date of March 21, 1960, and entitled, "Adjustable Chair," relates to chairs of various sorts which, from time to time, are required to be raised or lowered quickly; and this application is a continuation-in-part of the previously filed application Serial No. 16,432.

As is well-known, it has been common practice for many years to equip chairs, which are required to be adjustable as to height, with a hydraulic cylinder and piston for moving the body of the chair up and down. Foot pumps have long been used on such chairs for operating such hydraulic height-adjusting means. More recently electrically-driven pumps have been used in place of the foot pumps Application Serial No. 16,432 describes the use of an air-operated supplemental assembly to take the place of either the foot pump or the electrically-driven pump for operating the hydraulic height-adjusting means.

Under some conditions, or in some locations, suitable means for obtaining a supply of air under pressure may not be available. However, invariably there will always be available a ready supply of tap water under moderate pressure. The object of the present invention accordingly is to provide a simple and practical operating attachment, adapted for use with any chair of the type indicated equipped with a hydraulic cylinder and piston for raising and lowering the chair, which will utilize water delivered under moderate pressure, such as ordinary tap water, for operating the hydraulic height-adjusting means, thus dispensing with the necessity for any foot pump or other pump means in the base of the chair for this purpose.

Another object of this invention is to provide such an attachment, operated by the employment of water under moderate pressure, which can easily be connected up with the hydraulic height-adjusting means customarily built into the base of such adjustable chairs, and which, when so connected, will combine with such height-adjusting means in forming a novel and improved adjustable chair assembly.

A further object of the invention is to provide a water-operated attachment for the purpose mentioned which can be manufactured and sold at a moderate price so as to find a ready market and meet a need under conditions in which other devices for operating the hydraulic height-adjusting means in such a chair will either be less desirable or not feasible.

The construction and operation of the special operating attachment and the manner in which it functions as part of the improved adjustable chair assembly in attaining the above mentioned objects will be readily understood from the following brief description with reference to the accompanying drawings.

In the drawings:

FIG. 1A is an elevation of a common type of dental chain, having the customary hydraulic height-adjusting means in the base (but not shown), and illustrating a preferred manner of connecting the chair with the separated water operated attachment shown in FIG. 1B;

FIG. 1B is a sectional elevation of the separate water operated attachment;

FIG. 2 is a fragmentary sectional elevation taken on line 2—2 of FIG. 1B but drawn to a larger scale;

FIG. 3 is a section taken one line 3—3 of FIG. 2;

FIG. 4 is a sectional elevation of the base of the chair of FIG. 1A but drawn to a larger scale;

FIG. 5 is a schematic diagram illustrating the functional operation of the entire assembly; and

FIG. 6 is a fragmentary sectional elevation showing an optional location and mounting for the specal attachment.

Referring first to FIG. 1A, the reference 10 indicates, by way of illustration, a common type of adjustable dental chair mounted on a customary hollow pedestal base 11, the base in turn resting on the floor 12. The pedestal base 11 as usual contains means, comprising a hydraulic cylinder and piston (referred to later with reference to FIG. 4), for adjusting the height of the main body of the chair with respect to the base. However, any pumping means, such as the older type of foot pump, or the more modern electric motor-driven pump, for operating the hydraulic cylinder and piston, is entirely omitted from the pedestal base. Instead the hydraulic cylinder in the pedestral base is conected by a pipe or conduit 13, which is preferably, although not necessarily, placed beneath the floor, and the pipe 13 leads to the special attachment to be presently explained with reference to FIG. 1B. A pair of spring-controlled switches 14 and 15 are also placed in the pedestal base, or in the floor adjacent the pedestal base, and are arranged so as to be actuated whenever their spring-controlled elements are pressed downwardly by the foot of the operator.

Referring next to FIG. 1B, the attachment for operating the hydraulic height-adjusting means in the base 11 of the chair is mounted in a housing 16 which is placed at any desirable location with respect to the chair. The pipe or conduit 13, leading from the hydraulic cylinder in the base 11 of the chair is connected through the medium of a solenoid-operated, one-way check valve assembly 17 and a pipe 18 with a hydraulic reservoir cylinder 19. The check valve assembly 17 contains a spring-controlled element which normally permits the hydraulic fluid to pass only in the direction indicated by the arrow X in FIG. 1B, and thus from the reservoir cylinder 19, through the pipe 18, check valve assembly 17 and pipe or conduit 13 to the hydraulic cylinder in the pedestal base 11. However activation of the solenoid 20 causes the valve assembly 17 to be opened so as to allow flow in the reverse direction. Actuation of solenoid 20 is produced by operation of the foot switch 14 (FIG. 1A).

The hydraulic reservoir cylinder 19 (FIGS. 1B and 2) is mounted on the head 21 of a larger diameter cylinder 22 which is secured to the wall of the housing 16. The two cylinders 19 and 22 are co-axial. Cylinder 22 is a water cylinder and is connected at the bottom to a source of water under pressure, for example, tap water. A hydraulic piston 23 is mounted in the hydraulic reservoir cylinder 19. A water piston is mounted in the larger water cylinder 22. The two pistons 23 and 24 are mounted on opposite ends of a common piston rod 25. The head 21 of the water cylinder 22 (FIG. 2) is provided with a central channel for the piston rod 25, in which channel a suitable guide bushing 26 is mounted. This bushing has a small longitudinal passageway 27 to enable air to

pass from one cylinder to the other, and the head 21 also contains an air vent 28.

The water cylinder 22 (FIG. 1B) is connected by a pipe 29, a valve assembly 30 and a pipe 31 with a source (not shown) of water under pressure, thus, for example, to the tap water supply. The valve assembly 30 as mentioned later, contains a rotatable, spring-controlled element which, in normal position, shuts off the passage of water from pipe 31 and connects the pipe 29 and therewith cylinder 22 to a drainpipe 32. The spring-controlled element in the valve assembly 30 is operated by a solenoid 33, and this solenoid 33 is actuated by the other foot switch at the base of the chair, thus switch 15 (FIG. 1A).

The hydraulic cylinder and piston in the pedestal base 11 of the chair are shown in FIG. 4. The base pedestal assembly includes a lower stationary member 34 and an upper member 35 which rests on the lower member 34. The upper member 35 carries a base plate 36 spaced above the floor 12. The hydraulic cylinder 37 is secured at its lower end on the base plate 36, for example by welding, and is centrally positioned thereon. The pipe 13 is connected to an inlet and outlet port in the bottom of the cylinder 37. The hydraulic piston 38 is mounted in a cylinder 37 and is secured to a piston rod 39, the upper end of which piston rod is secured to a supporting crosshead 40 on which the main body of the chair is hingedly mounted. A hollow support shaft or sleeve 41, slidably mounted on the stationary hydraulic cylinder 37, also has its upper end secured to the crosshead 40. The lower end of this sleeve carries a guide ring 42 which is slidable up and down within a cylindrical guideway 43, and the sleeve 41 slides in an upper guideway ring 44 secured to the top of the guideway 43. The sleeve 41 and associated guide members give stability to the crosshead 40 and chair body as the chair is positioned at the desired height by the hydraulic piston and piston rod.

The operation of the entire adjustable assembly, including the special operating attachment, will be easily understood from the schematic diagram of FIG. 5. When the operator desires to raise the chair he closes switch 15 by pressing his foot on the spring-controlled plunger of the switch. This momentary closing of the switch 15 actuates the solenoid 33 causing the core of the solenoid to move in opposition to the spring 45 and to rotate the valve member 30' of the valve assembly 30 to the position shown in FIG. 5, which enables the water under pressure to pass from pipe 31 to connecting pipe 29 and into the water cylinder 22. This results in movement of piston 24, and with it the connected piston 23 in the hydraulic reservoir cylinder 19. Consequently hydraulic fluid is forced through pipe 18, past check valve assembly 17, through pipe 13 and into the hydraulic cylinder 37 in the chair base. The resulting increase of hydraulic fluid in the base cylinder 37 causes the upward movement of the piston 38 and piston rod 39 and consequently raises the chair body. When the chair has reached the desired height the operator takes his foot off the switch 15 which deactivates solenoid 33 causing valve member 30' to return to normal position under the force of spring 45. This shuts off water pipe 31 and connects the water cylinder 22 with the drain outlet 32. Since the check valve assembly 17 normally prevents any return flow of hydraulic fluid from the base cylinder 37 to the hydraulic reservoir cylinder 19, the chair remains at the height to which it has been raised.

To lower the chair the operator places his foot on the other switch 14. The closing of this switch activates solenoid 20, causing the plunger 20' to move against the force of its spring and engage the ball 17' in the valve assembly 17. The resulting unseating of the ball 17' enables hydraulic fluid to move from base cylinder 37 to the hydraulic reservoir cylinder 19, the weight of the chair being sufficient to cause this return flow of the hydraulic fluid whenever the ball 17' in the valve assembly 17 is kept unseated while the piston 24 in water cylinder 22 is free to move downwardly.

Due to the difference in area between the piston 24 in water cylinder 22 and the connected piston 23 in the reservoir cylinder 19 only a moderate amount of water pressure in cylinder 22, such as is commonly supplied in any water delivery system, is sufficient to produce the desired pressure on the piston 23 and consequently on the hydraulic piston in the base of the chair for raising the chair body. Electric current for actuating the solenoids 20 and 33 can be supplied by a simple storage battery, if no other source of current is available.

FIG. 6 shows a modified arrangement of the assembly in which the special operating attachment is mounted beneath the floor 12 under the base of the chair. In this arrangement water cylinder 22' and the hydraulic reservoir cylinder 19' are supported beneath the floor. The water supply pipe 46 leads to a valve assembly 47. A pipe 48 leads from valve assembly 47 to the water cylinder 22'. A drain pipe 49 is connected with the valve assembly 47. The valve assembly 47 contains a spring-controlled rotatable element (not shown) which normally closes off the pipe 46 and connects pipe 48 with the drain pipe 49. However foot pressure exerted on plunger 50 moves the rotatable element in the valve assembly 47 against the force of its spring, resulting in pipe 46 being connected with pipe 48 and the drain 49 being closed, and thus enabling water to pass into the cylinder 22'.

Hydraulic fluid from reservoir cylinder 19' passes through the pipe 51, past check valve assembly 52 (similar to check valve assembly 17 previously described), and through pipe 13 to the hydraulic cylinder in the chair base for the purpose of raising the chair. Foot pressure on plunger 53 opens the check valve assembly 52 to allow hydraulic fluid to pass in the reverse direction into reservoir cylinder 19' for the purpose of lowering the chair.

In this modified arrangement with FIG. 6 no electric switch or solenoids are required. This modified arrangement also has the advantage of being located entirely under the floor and out of sight.

Other modifications would be possible in the positioning of the special attachment and in minor details of construction of the entire assembly and without departing from the principle of the invention.

I claim:

The improved adjustable chair assembly comprising a hollow pedestal base mounted on the floor, a hydraulic cylinder mounted in said base on a vertical axis, a hydraulic piston in said cylinder having a piston rod extending upwardly from said piston and cylinder, a chair body carried by said piston rod for elevational adjustment, a second hydraulic cylinder located outside of said pedestal base and having a capacity of not less than said base cylinder, a hydraulic conduit leading from one end of said second cylinder to the bottom of said base cylinder, a third cylinder mounted on the other end of said second cylinder co-axial therewith, said third and said second cylinders having a common end wall but the diameter of said third cylinder being considerably greater than that of said second cylinder, a pison in said second cylinder and a piston in said third cylinder mounted on opposite ends of a common piston rod, a conduit connecting the end of said third cylinder opposite said common wall to a source of fluid under pressure, a discharge outlet for said third cylinder in said latter mentioned conduit, a spring-controlled valve in said latter mentioned conduit normally acting to shut off the delivery of fluid to said third cylinder from said source and to open said discharge outlet but, when moved against the force of its spring-control, acting to close said discharge outlet and to allow passage of fluid

through said latter mentioned conduit from said source to said third cylinder, means for operating said valve, a spring-controlled foot-operable element in said means, a spring-controlled check valve in said first mentioned conduit normally acting to allow hydraulic fluid to pass only from said second cylinder to said base cylinder, means for moving said check valve from normal position in order to allow the hydraulic fluid to pass in opposite direction from said base cylinder back to said second cylinder, and a second spring-controlled foot-operable element similar to and adjacent to said first element

included in said latter mentioned means, whereby said chair body can be raised or lowered by foot actuation of the respective foot-operable element.

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