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[54] **DENTAL STOOL FOR DENTIST AND DENTAL ASSISTANT**

[75] Inventors: **George A. Fortnam**, Des Moines; **Ivan E. Sams**, Indianola, both of Iowa

[73] Assignee: **Den-Tal-Ez Mfg., Co.**, West Des Moines, Iowa

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[51] **Int. Cl.** **F16m 11/00**

[58] **Field of Search** ..... 248/404, 400, 407, 408, 248/409, 354 H, 412; 297/345, 339; 188/300

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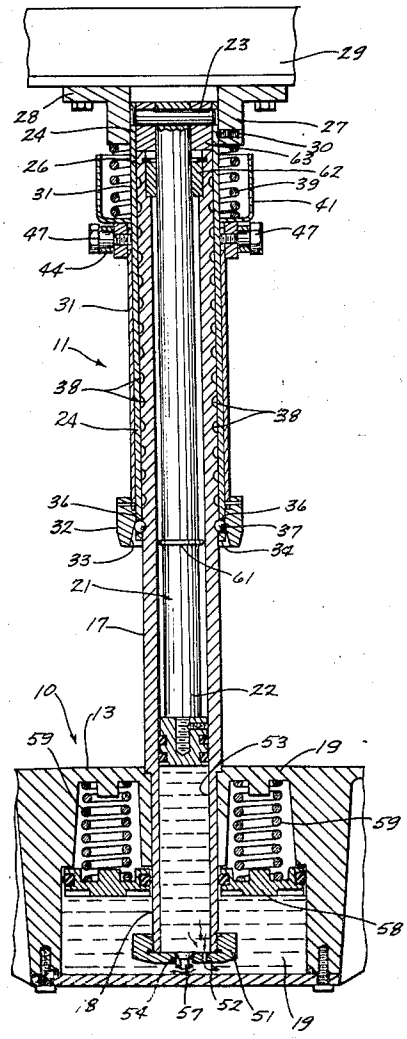
Primary Examiner—Marion Parsons, Jr.

Attorney, Agent, or Firm—Rudolph L. Lowell

[57] **ABSTRACT**

The stool is provided with a self-contained source of fluid under pressure and has a seat structure vertically adjustable by manipulation of a single actuating lever mounted on and below the seat structure. The rate of fluid flow is valve controlled to provide for a rapid elevation of the unloaded seat structure and a slow descent of the loaded seat structure to a selected adjusted position. In the adjusted position the seat structure is automatically mechanically locked against vertical movement by simply releasing the actuating lever.

5 Claims, 8 Drawing Figures



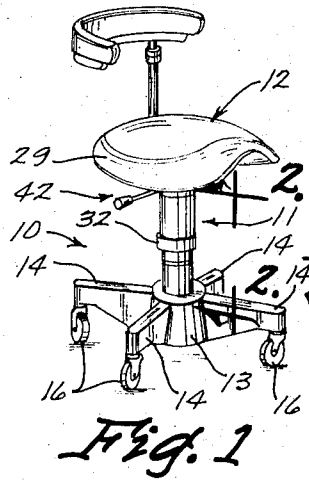
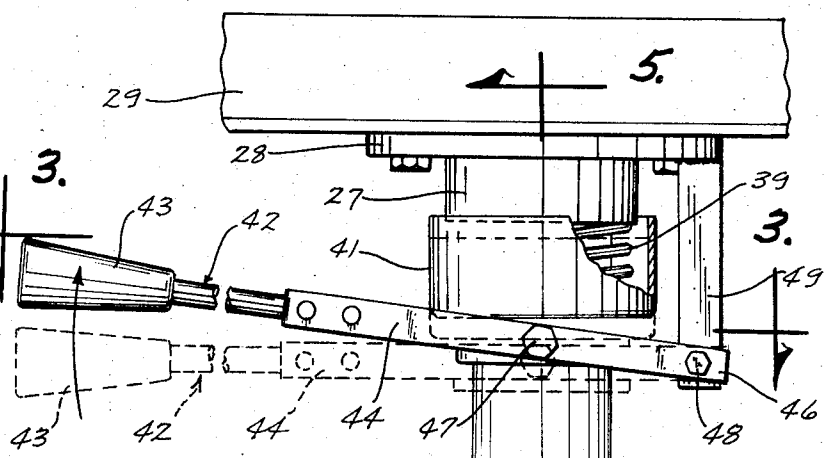


Fig. 1



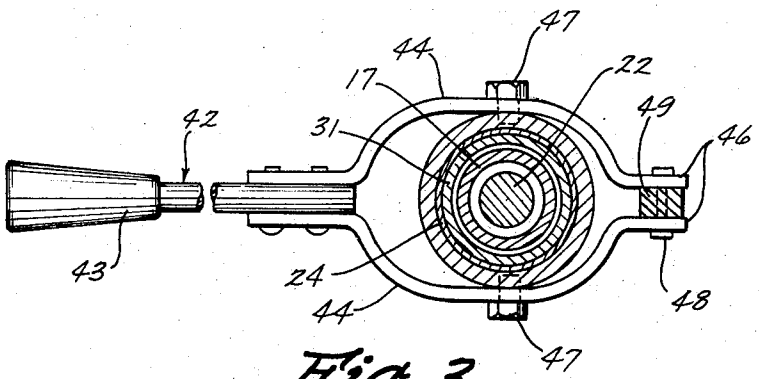


Fig. 3

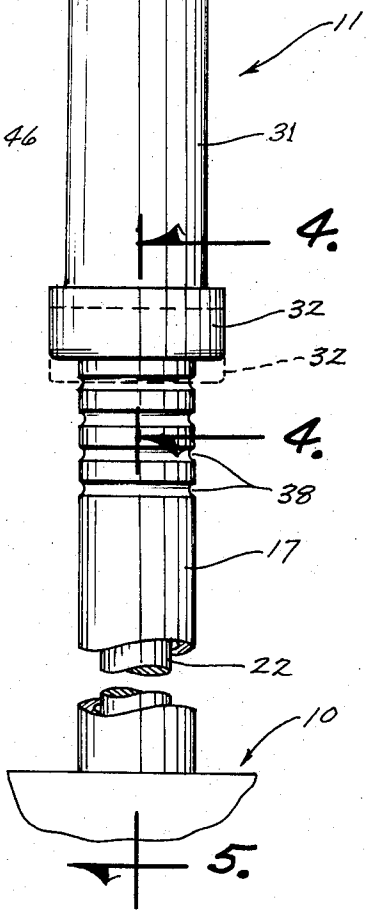


Fig. 2

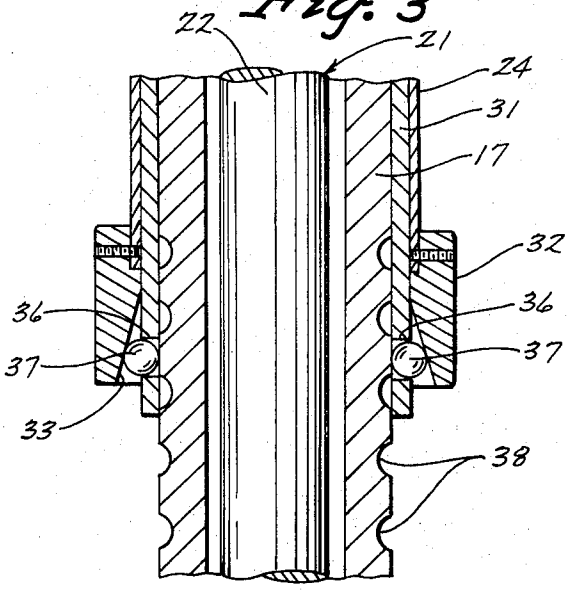


Fig. 4

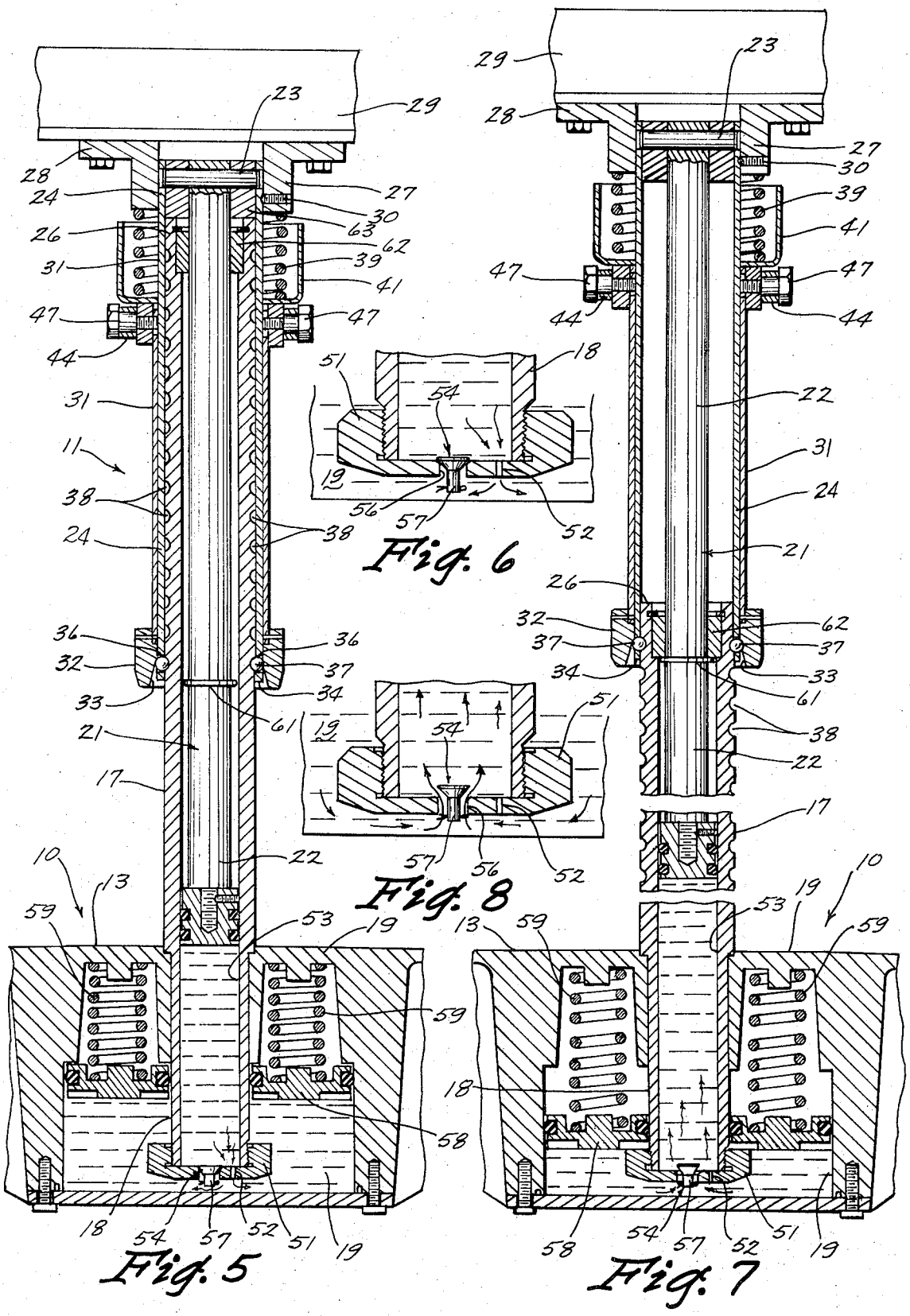


Fig. 5

Fig. 6

Fig. 8

Fig. 7

DENTAL STOOL FOR DENTIST AND DENTAL ASSISTANT

SUMMARY OF THE INVENTION

The stool is of a simple construction and efficient in operation to provide a quick and safe vertical adjustment of the seat structure to a mechanically locked adjusted position. The actuating lever for controlling the seat adjustment is located immediately below and within the dimensional confines of the seat for convenient accessibility and non-interference with a normal use of the chair. On actuation of the lever the seat structure, with a person thereon, is slowly movable downwardly to an adjusted position which is retained on release of the lever. This downward movement takes place against the action of fluid under pressure provided by a self-contained fluid pressure unit mounted on the stool base assembly. On actuation of the lever with the weight of a person removed from the seat, the seat is rapidly moved upwardly by the action of the fluid under pressure.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of the stool of this invention;

FIG. 2 is an enlarged foreshortened elevational view of the stool taken along the line 2—2 in FIG. 1;

FIG. 3 is a sectional view taken on line 3—3 in FIG. 2, showing an actuating lever for vertically adjusting the stool seat;

FIG. 4 is a detail sectional view on line 4—4 in FIG. 2, showing the means for mechanically locking the stool seat in a seat releasing position;

FIG. 5 is a longitudinal sectional view through the supporting column for the stool seat showing the parts in relative positions providing for the mechanical locking of the seat in a lowermost adjusted position;

FIG. 6 is an enlarged showing of the control valve assembly shown in FIG. 5;

FIG. 7 is illustrated similarly to FIG. 5 and shows the parts in changed positions showing the seat in an uppermost adjusted position; and

FIG. 8 is an enlarged showing of the control valve assembly shown in FIG. 7.

DETAILED DESCRIPTION OF THE INVENTION

With reference to the drawings the stool of this invention is illustrated in FIG. 1 as including a base assembly 10, a vertically extendible and retractable seat center post or supporting column 11 mounted on the base assembly, and a seat structure 12 carried on the upper end of the post 11. The base assembly (FIGS. 1 and 5) comprise a hollow cylindrically shaped hub member 13, integrally formed with radially extended legs 14, each of which carries a floor engaging caster wheel 16.

The center post 11 (FIG. 5) includes a tubular cylinder 17, projected axially upwardly from the hub member 13, with its lower end section 18 extended downwardly within and secured to the hub member 13. The hub member 13 functions as a fluid reservoir and is formed with a generally cylindrical fluid chamber 19 for a purpose to appear later. A piston 21 for the cylinder 17 has an elongated piston rod 22, the upper end of which is secured by a pin 23 to the upper end of a cylindrical sleeve 24 that is mounted about the upper

end section 26 of the cylinder 17 for slidable reciprocal movement relative thereto.

The top of the slidable sleeve 24 is received within a socket member 27 that depends centrally from the underside of a base plate 28 for the stool seat 29 of the seat structure 12. Friction or clamping screws 30 are used to secure the base plate 28 to the upper end 26 of the slidable sleeve 24, which is movable as a unit with the piston rod 22 relative to the cylinder 17. Mounted about the slidable sleeve 24 for relative axial movement is a supporting sleeve 31 for a ring shaped cam member 32 that is secured to the lower end of the supporting sleeve. The cam member 32 is formed on its inner side with a peripheral cam surface 33 that is inclined outwardly and downwardly relative to the adjacent lower end 34 of the slidable sleeve 24. Such lower end 34 has a pair of diametrically opposite openings 36 for receiving therein corresponding ball bearing or locking members 37.

The upper end section 26 of the cylinder 17 is formed with a series of vertically spaced grooves 38 of a semi-cylindrical shape in transverse cross section and of a size to receive therein a portion of a ball member 37. On a downward movement of the cam supporting sleeve 31, relative to the slidable sleeve 24 (FIG. 5), the ball members 37 are engaged by the cam surface 33 and laterally moved through associated openings 36 for partial reception into a selected groove 38 to mechanically lock the slidable sleeve against movement axially of the cylinder 17.

In this locked position of the cylinder 17 and slidable sleeve 24, it is to be noted that the ball members 37 are located within the outer peripheral confines of the slidable sleeve 24, and in a mating relation within a selected groove 38. A ball member 37 thus has a diameter substantially equal to the combined thickness of the slidable sleeve 24 and the depth of a groove 38. It is to be further noted that this mechanical locking of the slidable sleeve 24 against movement axially of the cylinder 17 permits a rotational movement of the slidable sleeve relative to the cylinder 17 in a supported position on the ball bearings 37.

On an upward movement of the slidable sleeve 24 relative to the cylinder 17 from its position in FIG. 5 to a position therefor shown in FIG. 4, it is seen that the ball members 37 are movable out of a selected groove 38 and through an associated opening 36 by the release action of the tapered cam surface 33. The ball members 37 are thus supported within the openings 36 between the cam surface 33 and the outer peripheral surface of the cylinder 17 to provide for slidable movement of the sleeve 24 relative to the cylinder 17. The ball members 37 and grooves 38 thus constitute a co-acting locking means that is actuated in response to a vertical reciprocal movement of the cam member 32 relative to the slidable sleeve 24.

The cam supporting sleeve 31 is yieldably urged downwardly of the slidable sleeve 24 by a coil spring 39 mounted about the upper end of the slidable sleeve and arranged in compression between the top of the cam supporting sleeve 31 and the seat base plate 28. The spring 39 is enclosed within a retaining cup 41.

The cam supporting sleeve 31 is moved upwardly to release the ball members 37 to their positions shown in FIG. 4 by means including an actuating lever 42 (FIGS. 2 and 3). The lever has a handle section 43, a central yoke or split section 44 and a fulcrum end section 46.

The yoke section 44 is arranged about the upper end of the cam supporting sleeve 31 for pivotal connection thereto by a pair of diametrically opposite pivot pins 47. The fulcrum end section 46 is pivotally connected at 48 to the lower end of a leg member 49 that is secured to and depends from the seat base plate 28. The pivot connections 47 and 48 of the actuating lever 42 are relatively arranged such that when the ball members 37 are in their locking positions, shown in FIGS. 5 and 7, the actuating lever 42 is in a substantially horizontal position, shown in dotted lines in FIG. 2.

On an upward movement of the lever 42 from its dotted line position shown in FIG. 2 to its full line position shown in the same figure, the cam supporting sleeve 31 is moved upwardly relative to the slidable sleeve 24 against the action of the coil spring 39. As previously explained, this upward movement of the cam supporting sleeve 31 provides for the release of the ball members 37 to their positions shown in FIG. 4. In this release position of the ball members, the piston rod 22, slidable sleeve 24, cam supporting sleeve 31 and the seat structure 12, are all vertically movable as a unit relative to the cylinder 17 to provide for a location of the ball members 37 opposite a selected one of the grooves 38. It will also be seen that when the lever 42 is released the coil spring 39 functions to automatically move the cam supporting sleeve 31 downwardly relative to the slidable sleeve 24 to in turn move the ball members 37 within the selected groove 38 whereby to mechanically lock the seat structure 11 in an adjusted position.

In adjusting the seat 29, the stool operator is seated and the vertical downward movement of the seat to an adjusted position takes place at a relatively slow rate of speed. For this purpose, the lower end 18 of the cylinder 17 is closed by a valve plate or end cover 51 (FIG. 5) which is threadably secured thereto. The valve plate 51 is formed with axially offset orifice 52 for fluid connecting the reservoir chamber 19 with a cylinder chamber 53 defined by the piston member 21 and valve plate 51.

A one-way valve unit 54 in the valve plate 51 comprises an axially located opening 56 extended through the valve plate and a valve member 57 for such opening movable upwardly to an open position and downwardly to a seated position for closing the opening 56. Opening and closing of the one-way valve unit 54 takes place in response to a variation of the fluid pressure in the cylinder chamber 53 relative to the fluid pressure in the reservoir chamber 19.

The fluid in the reservoir chamber 19 is maintained under pressure by means including a disk-like piston 58 movably mounted about the lower end 18 of the cylinder 17 in a fluid sealed engagement with the outer peripheral surface of the cylinder section 18 and the side wall of the chamber 19. The piston 58 is continuously urged in a downward direction by a plurality of coil springs 59 located about the cylinder lower end 18 and arranged in compression between the piston 58 and the top wall of the chamber 19 so as to apply, through the piston 58, a continuous pressure on the fluid in the chamber 19.

In the adjustment of the seat structure 12, let it be assumed that the seat 29 is in its uppermost position, illustrated in FIG. 7, wherein the ball members 37 are mechanically locked in the uppermost one of the grooves 38. This top adjusted position of the seat 29 is defined by the engagement of a stop collar 61 on the piston rod 22 with a bearing 62 for the rod 22 mounted in the upper end section 26 of the cylinder 17. With the stool operator on the seat 29, the lever 42 is actuated upwardly from its dotted line position to its full line position of FIG. 2. This actuation of the lever 42 provides for the release of the ball members 37 and a lowering of the piston 21 within the cylinder 17. Downward movement of the piston 21 increases the pressure of the fluid in the cylinder chamber 53 above the fluid pressure in the reservoir chamber 19 whereby the oneway valve unit 54 is closed so as to permit a flow of fluid from the cylinder chamber 53 into the chamber 19 only through the orifice opening 52 as shown particularly in FIG. 6. Since this orifice opening is of a relatively small diameter the downward movement of the piston and in turn of the seat structure 12 takes place at a relatively slow rate of speed. It is to be also noted that by reason of the downward movement of the piston 21 the flow of fluid into the chamber 19 increases the fluid pressure in such chamber resulting in a compression of the coil springs 59 and an upward movement of the piston 58 within the chamber 19.

The fluid flow through the orifice 52 continues until the ball members 37 are moved opposite a selected one of the grooves 38. On the release of the actuating lever 42, the downward movement of the cam supporting sleeve 31 by the operating spring 39 provides for the reception of the ball members within the selected groove to mechanically lock the seat structure 12 in the adjusted position. In an adjusted seat position the fluid pressure in the chambers 19 and 53 becomes stabilized or uniform by reason of their fluid connection through the orifice 52.

If an adjusted position of the seat structure 12, higher than a previously adjusted position is desired, the stool operator removes his weight from the seat structure 12 prior to an actuation of the lever 42 to its full line position in FIG. 2 to release the ball members 37 from the cylinder 17. On movement of the ball members 37 to their released positions shown in FIG. 4, the piston 58 is moved downwardly by the action of the spring 59 to force fluid upwardly into the cylinder chamber 53, by virtue of the now reduced fluid pressure in the chamber 53. As a result of this reduced fluid pressure the oneway valve unit 54 is opened to its position shown in FIGS. 7 and 8 to give the piston 21 an accelerated upward movement relative to the downward movement thereof to an adjusted position. This faster rate of upward movement of the piston rod 22 is due to the upward flow of oil through both the opening 56 and orifice 52, and the larger cross sectional area of the opening 56 relative to the cross sectional area of the orifice 52.

When the piston rod 22, and, in turn, the seat structure 12 has been elevated to a position higher than a desired adjusted position, the stool operator merely applies his weight on the seat structure and adjusts the seat to a desired position in the manner previously described.

Adjustment of the seat may thus be made in any one of the grooves 38 shown in FIG. 5, with the uppermost elevated position of the seat structure being shown in FIG. 7 and the lowermost adjusted position in FIG. 5. In a lowermost adjusted position of the seat 29 the rod bearing 62 is engageable with a plug member 63 provided in the upper end of the slidable sleeve 24. As best

shown in FIG. 1, the actuating lever 42 is located substantially within the confines of the seat structure 12 and adjacent the underside thereof so as to be conveniently accessible to the stool operator.

Although the invention has been described with respect to a preferred embodiment thereof, it is to be understood that it is not to be so limited since changes and modifications can be made therein which are within the full intended scope of this invention as defined by the appended claims.

We claim:

1. In a dental stool including a base assembly, and a seat structure:

a. means supporting the seat structure for adjustable vertical movement relative to said base assembly including an upright cylinder rigidly mounted on said base assembly centrally thereof,

b. an elongated piston for said cylinder movable to extended and retracted positions relative to the upper end of said cylinder,

c. means mounting said seat structure on the upper end of said piston for movement therewith,

d. means movable with and secured to said seat structure in a concentrically spaced relation about said piston having an inner peripheral surface in bearing engagement with the outer peripheral surface of said cylinder,

e. coacting means on said cylinder and on said movable means for releasably mechanically locking said movable means against movement longitudinally of said cylinder to hold said seat structure in a vertically adjusted position, and to rotatably support said movable means on said cylinder when the seat structure is in an adjusted position,

f. means for releasing and actuating said coacting locking means including a manually operated lever pivotally supported on said seat structure,

g. a source of fluid under pressure on said base assembly in fluid communication with said cylinder, and

h. means for controlling the rate of fluid flow to and from said cylinder to vary the rate of retraction of said piston relative to the rate of extension thereof so that when the coacting locking means is released the seat structure with a person seated thereon is movable downwardly at a slower rate than the upward rate of movement thereof without a person seated thereon.

2. In a dental stool according to claim 1 wherein:

a. said movable means comprises a slidable cylindrical sleeve member having a side wall, and

b. said coacting locking means includes a locking member mounted in said side wall for lateral movement to a first position projected inwardly of said inner peripheral surface and to a second position located outwardly of said inner peripheral surface,

c. the outer peripheral surface of said cylinder formed with a series of vertically spaced indentations for selectively receiving said locking member in the first moved position therefor,

d. said locking member being movable to said first position therefor in response to an actuation of said coacting locking means by said lever.

3. In a dental stool according to claim 2 wherein:

a. said locking member constitutes a ball member having a diameter greater than the thickness of the side wall of said slidable sleeve member, and

b. the means for releasing and actuating the coacting locking means includes an annular cam member mounted about said slidable sleeve member having a cam surface engageable with the ball member, and

c. means movably connecting the annular cam member to said operating lever for longitudinal movement in one direction relative to said slidable sleeve member in response to a pivotal movement of said operating lever, said ball member on longitudinal movement of the cam member in said one direction being released for outward movement to the second position therefor, and on movement of the cam member in an opposite direction, being moved inwardly by said cam surface into a selected one of said indentations to the first position therefor.

4. In a dental stool according to claim 3, including:

a. a spring means mounted in compression between said cam member and said seat structure for continuously yieldably urging said cam member in said opposite direction.

5. In a dental stool according to claim 1 wherein:

a. said source of fluid under pressure includes a fluid reservoir arranged centrally of said base assembly, and said cylinder has a lower end section projected downwardly within said fluid reservoir,

b. said control means including a valve plate mounted in a closing relation with the lower end of said cylinder to form with said piston an expansible chamber within said cylinder,

c. said valve plate having an orifice extended therethrough to fluid connect said reservoir with said expansible chamber, and

d. a one way valve unit in said valve plate providing for a uni-directional flow of fluid from said reservoir into said expansible chamber, said orifice having a cross-sectional area less than the crosssectional area of said valve unit.

* * * * *