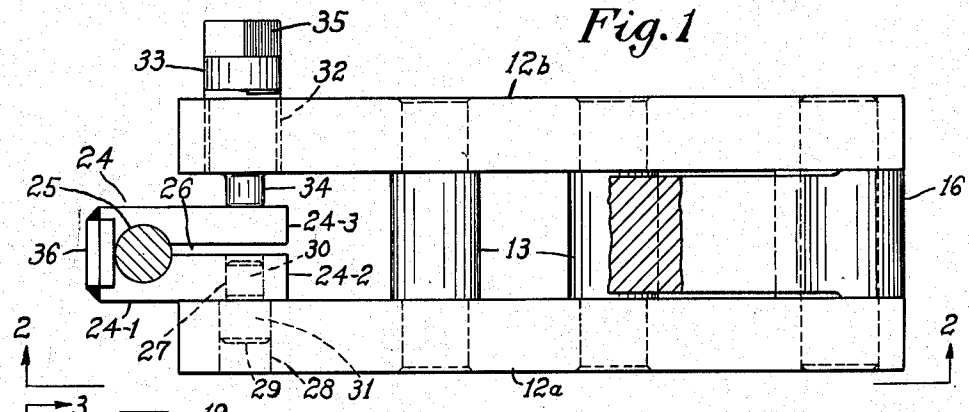
Aug. 8, 1950 D. J. BINUS 2,517,831

ADJUSTABLE LINKAGE FOR DENTAL CHAIRS AND THE LIKE

Filed July 1, 1946 3 Sheets-Sheet 1

Fig. 1



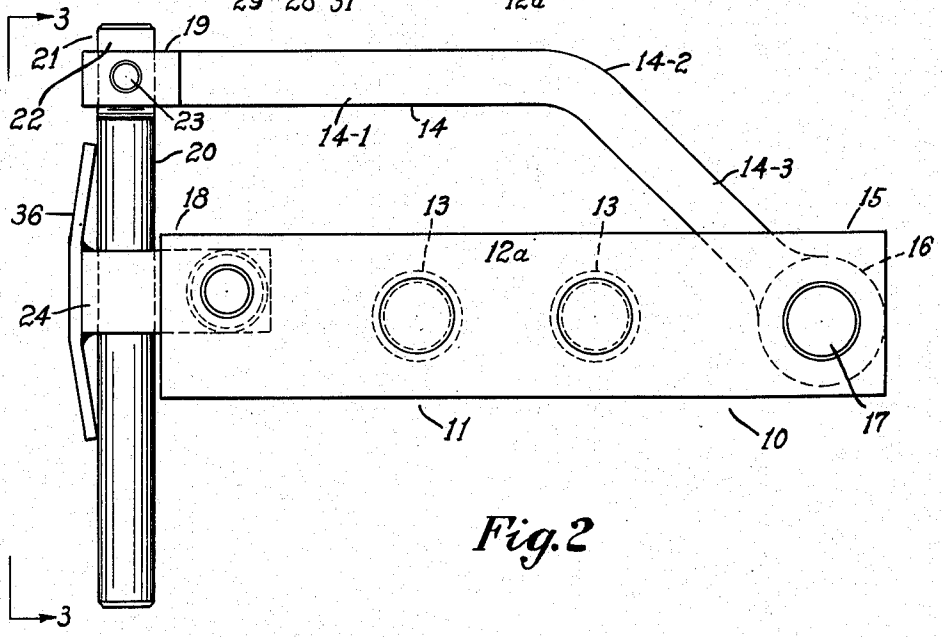


Fig. 2

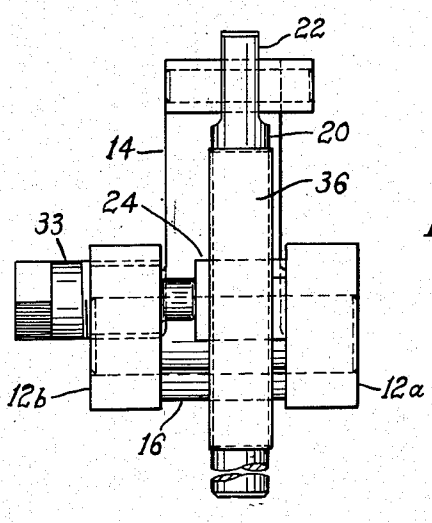


Fig. 3

INVENTOR.
BY David J. Binus
Frease and Bishop
ATTORNEYS

Aug. 8, 1950 D. J. BINUS 2,517,831

ADJUSTABLE LINKAGE FOR DENTAL CHAIRS AND THE LIKE

Filed July 1, 1946 3 Sheets-Sheet 2

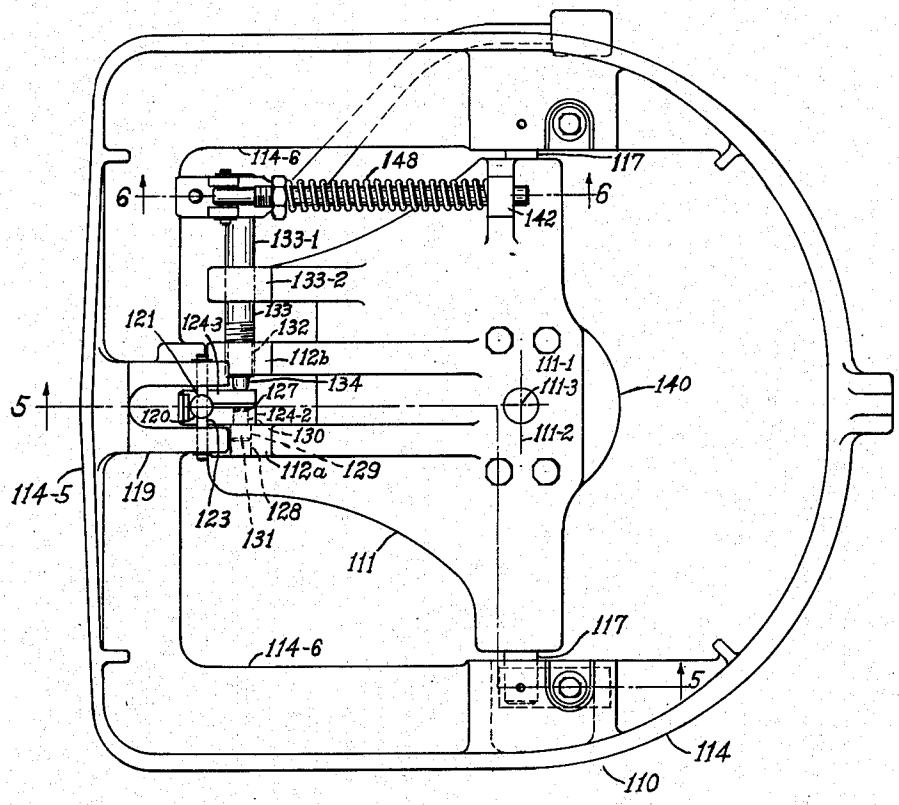


Fig. 4

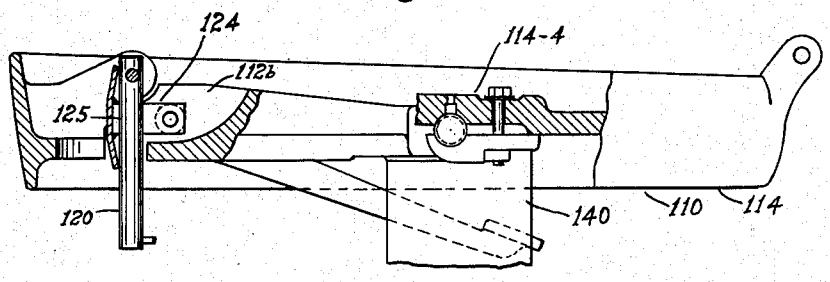


Fig. 5

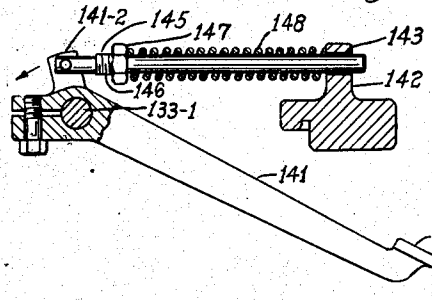


Fig. 6

INVENTOR.
David J. Binus
BY
Dreas and Bisbee
ATTORNEYS

Aug. 8, 1950 D. J. BINUS 2,517,831

ADJUSTABLE LINKAGE FOR DENTAL CHAIRS AND THE LIKE

Filed July 1, 1946 3 Sheets-Sheet 3

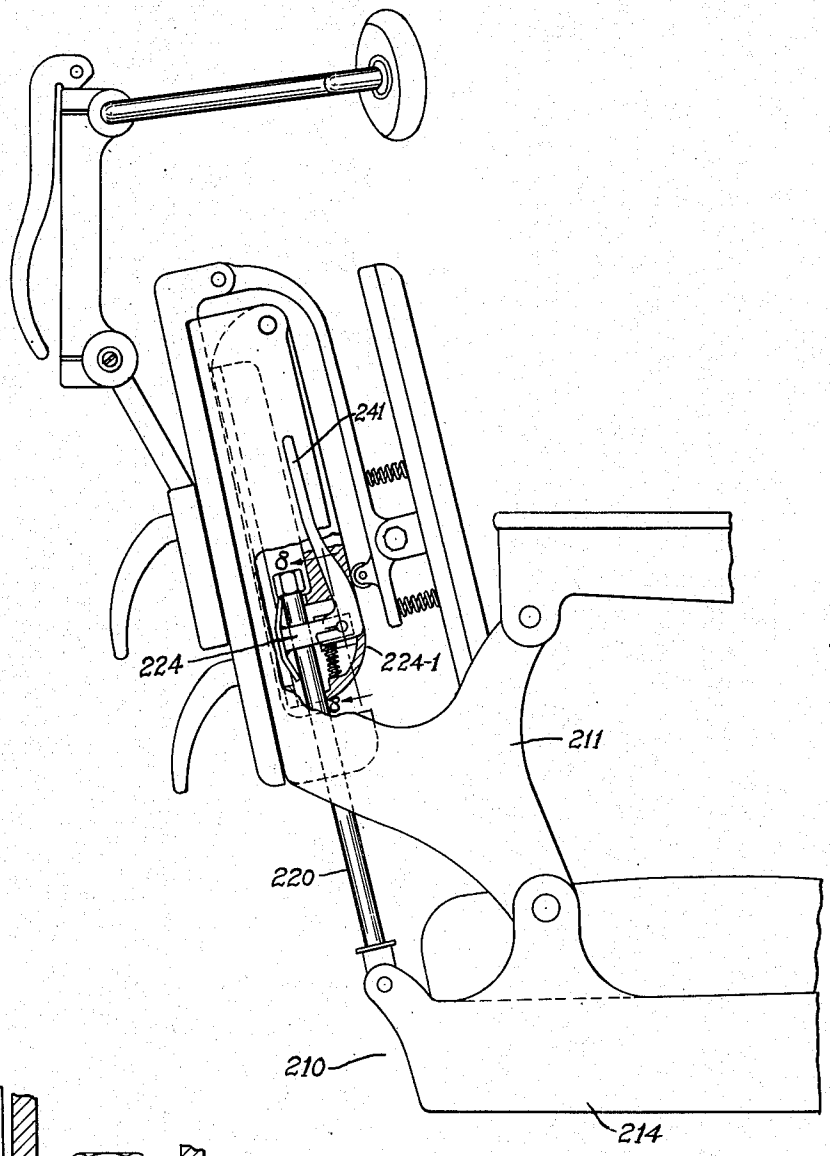


Fig. 7

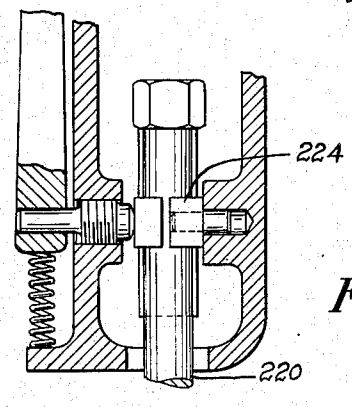


Fig. 8

INVENTOR
BY David J. Binus
Treasr and Bishoff
ATTORNEYS

Patented Aug. 8, 1950 2,517,831

UNITED STATES PATENT OFFICE

2,517,831

ADJUSTABLE LINKAGE FOR DENTAL CHAIRS AND THE LIKE

David J. Binus, Canton, Ohio, assignor to The Weber Dental Manufacturing Company, Canton, Ohio, a corporation of Ohio

Application July 1, 1946, Serial No. 680,755

1 Claim. (Cl. 74—531)

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The invention relates to adjustable linkages for dental chairs and the like, and in which the linkage includes a plurality of three or more link bars and at least three pivotal connections, each pivotal connection being between two of the link bars, and at least two of the link bars each being included in two of the pivotal connections, and the linkage being adjustable so that the distance between the pivot axes of two of the pivotal connections may be varied and the linkage locked or clamped at any desired position of adjustment, thereby varying the angular relationships between the bars of the linkage.

In a dental chair one of the bars of such an adjustable linkage may be secured on the top of the upper extensible member of the usual jack of a dental chair, and one of the bars may provide a support for the seat frame of the chair and the pivotal connection between the jack supported bar and the seat frame supporting bar having a horizontal pivot axis, and this axis being the axis about which any desired tilt relative to the horizontal is given to the seat frame.

In such seat tilting linkages on usual dental chairs prior to the present improvements, considerable difficulty has been encountered in providing for the adjustment of the linkage whereby the ends of the jack supported link bar and the seat supporting link bar not pivotally connected with each other are swung towards and away from each other and locked at any desired position relative to each other by the remaining adjustable link bar means of the linkage.

The adjustable link bar means for such usual seat tilting linkages for dental chairs have included a relatively large number of parts, with which considerable difficulties are encountered in manufacture and assembly, and which are inconvenient to operate. One such usual adjustable link bar means for a dental chair linkage, with which the above enumerated difficulties have been encountered, includes a plurality of flat plates or discs included as part of one of the pivotal connections and between which extends a plurality of flat plates or leaves included as part of one of the link bars, together with means for clamping the interposed plates against each other.

In such an adjustable link bar means, the multiplicity of the interposed flat plates results in relatively expensive manufacture and assembly, as well as inconvenient operation.

The multiple interposed flat plates with clamping means previously used in adjustable link bar means for usual seat tilting linkages for dental chairs are superior in clamping action than another type of adjustable link bar means in which one of the link bars is a slide bar usually cylindric and which slides in a fitting sleeve pivoted in a plane containing the longitudinal axis of the slide bar, and there being clamping screw means operating to effect a clamping action between the sleeve and the slide bar also in a plane containing the longitudinal axis of the slide bar. This clamping action operating between the pivot sleeve and the slide bar in a plane containing the longitudinal axis of the slide bar is not as effective as the interposed plates clamped against each other, and moreover frequently slips under load.

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The objects of the present invention include the provision of an improved adjustable linkage particularly adapted for use in a dental chair and the like, and which is simplified in construction and in the arrangement and cooperation of its parts, and particularly with respect to its adjustable link bar means, so that for each of the separate parts the required fabricating operations may be accomplished largely by rotary machining and grinding operations.

Further objects of the present invention include the provision of such an improved adjustable linkage in which quick and easy adjustments may be made in its adjustable link bar means, and in which a very tight locking or clamping may be effected between the adjusted parts.

Further objects of the present invention include the provision in an adjustable linkage of clamping means operative in combination with a link bar to provide a variable distance between two of the pivotal connections of the linkage, and of such nature that when one of the link bars of the linkage has a load applied thereto, the clamping action increases cumulatively as the load increases.

The foregoing and other objects are attained by the adjustable linkage, adjustable link bar means, parts, combinations, and sub-combinations which comprise the present invention and the nature of which is set forth in the following general statement, and preferred embodiments of which together with their mode of use are set forth in the following description, and which are particularly and distinctly pointed out and set forth in the appended claim forming part hereof.

The nature of the present invention may be stated in general terms as including in an adjustable linkage for a dental chair and the like, a plurality of link bars, pivotal connections between some of the link bars, and some of the link bars being each included in two of the pivotal connections, two of the link bars each being included in only one of the pivotal connections and consti-

tuting parts of an adjustable link bar means, the adjustable link bar means including in addition to the pivotal connection in which each of its two link bars are included, a slide bearing aperture in one of the link bars of the adjustable link bar means and a portion of the other link bar of the adjustable link bar means being shaped to slidably fit in the slide bearing aperture, and the slide bearing aperture being offset from the pivotal connection of the link bar in which it is included, and means for clamping the relatively slidable link bars so as to secure them at any desired position of adjustment.

By way of example, embodiments of the improved adjustable linkages of the present invention are illustrated in the accompanying drawings forming part hereof, in which

Figure 1 is a top plan view of one of the improved linkages, with portions broken away;

Fig. 2 is a side elevation thereof looking in the direction of the arrows 2—2, Fig. 1;

Fig. 3 is an end elevation thereof looking in the direction of the arrows 3—3, Fig. 2;

Fig. 4 is a top plan view of the seat frame of a dental chair included as part of one of the improved adjustable linkages, mounted on the top of the upper lifting member of a usual dental chair elevator;

Fig. 5 is a fragmentary sectional view thereof as on line 5—5, Fig. 4;

Fig. 6 is another fragmentary sectional view thereof as on line 6—6, Fig. 4;

Fig. 7 is a fragmentary side elevation of a dental chair including another embodiment of the improved adjustable linkage hereof for adjustably tilting the dental chair back with reference to its seat frame; and

Fig. 8 is a fragmentary sectional view thereof as on line 8—8, Fig. 7.

Similar numerals refer to similar parts throughout the drawings.

One embodiment of the improved adjustable linkage of the present invention is illustrated in Figs. 1, 2, and 3, and indicated generally by 10, and includes a first link bar indicated generally by 11, which as shown is of plural member construction and includes two laterally spaced longitudinally extending bar members 12*a* and 12*b* which are preferably parallel with each other and may be secured in spaced relationship with each other as by longitudinally spaced shouldered rivet studs 13.

The adjustable linkage 10 furthermore includes a second link bar indicated generally by 14, which as shown includes one longitudinally extending straight portion 14—1 which is angled at a central bend 14—2 with respect to a second longitudinally extending straight portion 14—3. The straight portion 14—1 of the link bar 14 as shown is located above and is parallel with the bar members 12*a* and 12*b* of the first link bar 11. The other straight portion 14—3 of the link bar 14 inclines downwardly from the bend 14—2 and extends between the bar members 12*a* and 12*b* adjacent one end 15 of the link bar 11, where the end of the straight portion 14—3 of the link bar 14 is provided with an enlarged pivot bearing head 16 having a central bore, horizontal as shown, which registers with similar bores provided in the bar members 12*a* and 12*b*. A pivot pin 17 extends through the registering bores in the bar members 12*a* and 12*b* and the intervening pivot bearing head 16, and provides therewith a pivotal connection between the link bar 11 and the link bar 14.

Above the other end 18 of the link bar 11, the outer end of the straight portion 14—1 of the link bar 14, as shown, is formed to constitute part of another pivotal connection in the linkage 10, as by providing an outwardly opening U pivot bearing head 19.

The adjustable linkage 10 furthermore includes a third link bar indicated generally by 20, and which, as shown and preferably for certain purposes of the present improvements, is in the form of a longitudinally extending cylindric rod, the upper end of which is shaped as a pivot bearing head 21 having opposite flat faces 22 fitting between the inner opposite faces of the U pivot bearing head 19 of the second link bar 14. The pivot heads 21 and 19 have formed therein registering bores in which is fitted a pivot pin 23, and the construction including the pivot heads 19 and 21 and pivot pin 23 constitutes another pivotal connection in the linkage 10.

The adjustable linkage 10 furthermore includes a fourth link bar indicated generally by 24, which as shown, and preferably for the purposes of the present improvements, is in the form of a U clamp link bar having an outer base portion 24—1 from which extend U leg portions 24—2 and 24—3, which are located between the bar members 12*a* and 12*b* at the end 18 of the link bar 11.

The base portion 24—1 of the U clamp link bar 24 has formed therein as shown a cylindric slide bearing bore 25 which communicates at one side with the opening 26 between the U leg portions 24—2 and 24—3, and the cylindric rod link bar 20 fits in and entends through the bore 25 beyond the end 18 of the link bar 11.

The U leg portions 24—2 of the U clamp link bar 24 has formed therein a pivot bearing bore 27, and the bar member 12*a* of the link bar 11 has formed therein an enlarged pivot bearing bore 28 axially aligned with the pivot bearing bore 27. A pivot stud 29 has a cylindric shank 30 fitting in the bearing bore 27 and an enlarged cylindric head 31 fitting in the bearing bore 28. There is thus formed a pivotal connection between the U clamp link bar 24 and the link bar 11.

The slide bearing bore 25 and the pivot bearing bore 27 are thus offset from each other in the U clamp link bar 24, and this relationship constitutes an important feature of the invention.

For the purpose of providing an adjustable and releasable clamping or locking between the U clamp link bar 24 and the cylindric slide rod link bar 20, the bar member 12*b* of the link bar 11 has formed therein an internally threaded bore 32 which is opposite the adjacent outer face of the U leg portion 24—3 of the U clamp link bar 24. Preferably as shown the threaded bore 32 is axially aligned with the bores 27 and 28. An externally threaded clamp screw 33 is screwed in the internally threaded bore 32 and has an inner reduced clamping head 34 abutting against the adjacent outer face of the U leg portion 24—3 of the U clamp link bar 24. The outer end of the clamp screw 33 as shown is formed as a square head 35 for permitting easy rotation of the clamp screw 33 by a wrench. When desired a lever handle may be secured on the outer end of the clamp screw 33.

For maintaining alignment of the slide rod link bar 20 when the U clamp link bar 24 is released, there is provided on the U clamp link bar 24 a bowed flat leaf spring 36 whose central portion is secured to the outer face of the base portion 24—1 of the U clamp link bar 24, the ends of the leaf spring 36 extending in opposite

directions from the base portion 24—1 and pressing against the outer side of the slide rod link bar 20.

In the operation of the improved adjustable linkage 10, when the clamping screw 33 is turned so that its clamping head 34 moves in the direction away from the U leg portion 24—3 of the U clamp link bar 24, the clamping pressure of the U clamp link bar 24 on the cylindric slide rod link bar 20 is released, and the slide rod link bar 20 is free to slide in either direction through the bore 25 of the U clamp link bar 24 thereby permitting swinging of the second link bar 14 on the pivot pin 17 up or down as viewed in the drawing.

The slide rod link bar 20 and the U clamp link bar 24 as thus associated with each other may be considered adjustable link bar means having two pivotal connections one with the first link bar 11 and the other with the second link bar 14, and the linkage 10 may be considered in one sense as a three bar linkage. However, in another sense the adjustable linkage 10 may also be considered as a four bar linkage without pivotal connection between the slide rod link bar 20 and the U clamp link bar 24.

Considered as a unitary adjustable link bar means or assembly, it is obvious that the combination of the slide rod link bar 20 and the U clamp link bar 24 may be used as an adjustable link bar unit in an adjustable linkage having any desired number of link bar units.

Moreover, the particular combination of the opposite spaced bar members 12a and 12b, the mounting of the U clamp link bar 24 therebetween at the end 18, and the clamp screw 33, constitutes in itself an improved pivot vise particularly adapted for releasably clamping and holding the rod 20 or similar piece at any desired angle over a wide range with respect to the longitudinal axis of the bar members 12a and 12b.

The objects of the invention are thus attained by the construction and arrangement of the adjustable linkage 10 as above described, and as illustrated, and which are particularly adapted for the performance of the greater number of machining or grinding operations on the several parts by the use of rotary machine tools. Also the easy and rapid assembly of the improved linkage 10 is attained, and its operation is easy and quick in effecting release or locking of the U clamp link bar 24 on the slide rod link bar 20.

Moreover, offsetting the cylindric slide bearing bore 25 for the cylindric rod link bar 20 from the common axis of the pivot bearing bore 27 and the clamping screw 33 produces a binding or cocking of the U clamp link bar 24 on the slide rod link bar 20, when for example the link bar 11 is a base such as when supported on the top of the upper member of a dental chair elevator, and when the link bar 14 is loaded such as when it supports or is a part of a dental chair seat frame.

In Figs. 4 to 6 inclusive is illustrated a second embodiment 110 of the improved adjustable linkage mounted on the top of the upper lifting member 140 of a usual dental chair elevator, not otherwise shown.

In the linkage 110, the first link bar indicated generally by 111 is in the form of a one-piece generally triangular cast member secured on the top of the upper lifting member 140 of the dental chair elevator. The second link bar indicated generally by 114 is in the form of a dental chair seat frame cast as a one-piece member.

The triangular one-piece link bar 111 has, at opposite ends of its base portion 111—1 on a common horizontal axis indicated by the dot-dash line 111—2 and which intersects at 111—3 the vertical axis of movement of the elevator upper lifting member 140, two opposite outwardly extending pivot trunnions 117 each of which pivots in bearing means 114—4 on the seat frame link bar 114. The first link bar 111 and the second link bar 114 thus have co-axial pivotal connections with each other.

From the front side 114—5 of the seat frame link bar 114 extends rearwardly a rearwardly opening U pivot bearing head 119. A third cylindric rod link bar 120 has an upper pivot bearing head 121 extending with clearance between the inner opposite faces of the U pivot bearing head 119 of the second link bar 114. The pivot heads 121 and 119 have formed therein registering bores in which is fitted a pivot pin 123. There is thus provided a pivotal connection between the second link bar 114 and the third link bar 120.

A fourth link bar indicated generally by 124 has a construction similar to the U clamp link bar 24, and a similar arrangement with the cylindric slide rod link bar 120. The bearing bore 125 of the U clamp link bar 124 is offset from the pivot bearing bore 127 in the U leg portion 124—2 of the U clamp link bar 124.

The first link member 111 has formed therein on opposite sides of the U clamp link bar 124, two upstanding laterally spaced lugs 112a and 112b. In the lug 112a there is formed an enlarged pivot bearing bore 128 axially aligned with the pivot bearing bore 127. A pivot stud 129 has a cylindrical shank 130 fitting in the bearing bore 127 and an enlarged cylindric head 131 fitting in the bearing bore 128. There is thus formed a pivotal connection between the U clamp link bar 124 and the link bar 111.

The lug 112b on the link bar 111 has formed therein an internally threaded bore 132 which is opposite the adjacent outer face of the U leg portion 124—3 of the U clamp link bar 124. Preferably as shown the threaded bore 132 is axially aligned with the bores 127 and 128. An externally threaded clamp screw 133 is screwed in the internally threaded bore 132 and has an inner reduced clamping head 134 abutting against the adjacent outer face of the U leg portion 124—3 of the U clamp link bar 124. Extending laterally beyond its threaded portion and away from the lug 112b, the clamp screw 133 has a cylindric shank 133—1. Laterally offset from the lug 112b, the link bar 111 has an upstanding bearing block 133—2 with a bearing bore therein through which the shank 133—1 extends and fits.

The seat frame link bar 114 engirdles a relatively large frame opening 114—6, and the outer end of the shank 133—1 is located above the opening 114—6, and the outer end of the shank 133—1 has secured thereon the upper end of an operating lever 141 which extends downwardly through the opening 114—6 and is curved outwardly and terminates in a foot pedal 141—1 at one side of the seat frame link bar 114. Above the clamp screw shank 133—1 the lever 141 is provided with upwardly extending laterally spaced lugs 141—2. The link bar 111 is provided with an upwardly extending guide block 142 having a guide bore 143 formed therein and extending at right angles with the pivot axis 111—2, and the

guide bore 143 is aligned with the space between the laterally spaced lugs 141—2.

A guide shaft 145 has a pivotal connection between its forward end and the lugs 141—2, as by means of a pivot pin extending through registering bores in the lugs 141—2 and the intervening end of the guide shaft 145. The rear end of the guide shaft 145 extends slidably with clearance through the bore 143 in the block 142. Intermediate the ends of the guide shaft 145 there are formed thereon external threads 146 on which is screwed an adjusting nut 147, and a helical compression spring 148 extends around the shaft 145 and is interposed between the nut 147 and the opposite face of the block 142. The compression spring urges the shaft 145 away from the block 142, and forwardly towards the front of the seat frame link bar 114.

The lever lugs 141—2 pivotally connected with the shaft 145 are thus urged forwardly and the clamp screw 133 is urged in a counter clockwise direction as viewed in Fig. 6. The threads on the clamping screw are preferably right hand threads, and the clamping screw 133 is thus urged to maintain a clamping and locking pressure on the U clamp link bar 124 and thus on the slide rod link bar 120 thereby serving to automatically maintain the seat frame link bar 114 at any particular tilted position with respect to the horizontal base link bar 111.

For changing this tilt, the operator depresses the pedal 141—1 and thus the lever 141, and releases the clamping pressure of the screw 133 on the U clamp link bar 124, and permits tilting the seat frame link bar 114 to any other desired position.

In Figs. 7 and 8 a dental chair indicated generally by 210 includes another embodiment of the improved adjustable linkage hereof for adjustably tilting the dental chair back with reference to its seat frame. In this embodiment of the improvements, the first link bar is constituted by the one-piece back 211, the second link bar is constituted by the seat frame 214, the third link bar is constituted by the slide rod 220, the fourth link bar is constituted by a back tilting lock block 224—1, and the fifth link bar is constituted by the U clamp 224, and these link bars are pivotally connected with each other in a manner similar to the embodiments 10 and 110, and the U clamp link bar is operated by a spring pressed lever 241, similar to the spring pressed lever 141 in the embodiment 110. In the embodiment 210 any desired tilt of the one-piece back link bar 211 is attained by actuation of the lever 241, and it is to be noted that the clamping action of the U clamp link bar 224 operates two ways and when the linkage is in the clamped condition the slide rod link bar 220 can slide neither up nor down, which is a distinct advantage in use.

The embodiments of the present improvements illustrated and described herein are by way of example, and the scope of the present invention is not limited to the same or to the particular details thereof but is commensurate with any and all novel subject matter contained herein which may at any time properly under the patent laws be set forth in the claim hereof or originating herein, and the elements of any such claim are intended to include their reasonable mechanical and functional equivalents.

I claim:

In adjustable linkage apparatus, a U clamp link bar, the U clamp link bar including a base portion and oppositely spaced U leg portions extending from the base portion, two members secured in opposite spaced relation with each other, the U leg portions extending between the spaced members, pivotal connecting means between one of the spaced members and one of the U leg portions, a slide link bar extending through the opening between the spaced U leg portions of the U clamp link bar and between its base portion and the pivotal connecting means, and means operatively mounted on the other spaced member for varying by the application of pressure on the U leg portions the distance between the U leg portions of the U clamp link bar, and the base portion of the U clamp member having a slide bearing opening communicating at one side with the opening between the U leg portions, and the slide link bar slidably fitting and extending through the slide bearing opening, and an elongated leaf spring having its central portion secured on the outside of the base portion of the U clamp member and having ends on opposite sides of the U clamp member in spring abutment against a side of the slide link bar.

DAVID J. BINUS.

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