United States Patent [19]

Caldemeyer

[11] **3,794,381**

[45] **Feb. 26, 1974**

[54] **FOOTREST FOR RECLINING CHAIR**

[76] Inventor: **Daniel F. Caldemeyer,** 4300 Jennings Ln., Evansville, Ind. 47712

[22] Filed: **Oct. 26, 1971**

[21] Appl. No.: **192,537**

[52] **U.S. Cl.** **297/430,** 297/435

[51] **Int. Cl.** **A47c 7/50**

[58] **Field of Search** 297/429, 430, 435, 68, 84, 297/330, 423, 271

[56] **References Cited**

UNITED STATES PATENTS

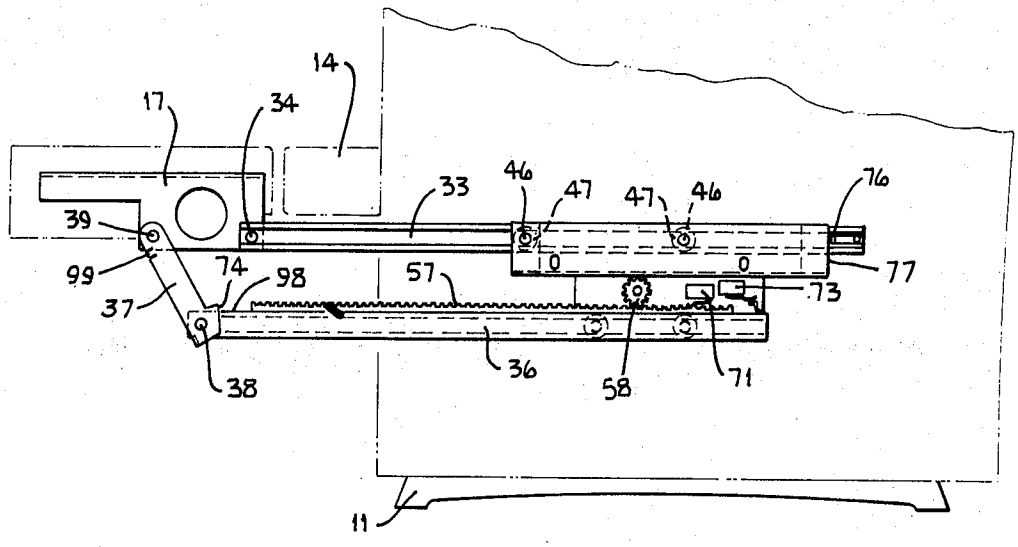
2,714,922	8/1955	McKibban et al.	297/330
3,072,437	1/1963	Shea et al.	297/435
3,588,170	6/1971	Knabusch et al.	297/69
741,121	10/1903	Fisher	297/68
513,169	1/1894	Armstrong	297/69
2,602,490	7/1952	Earl	297/430

Primary Examiner—Francis K. Zugel
Assistant Examiner—Kenneth J. Dorner
Attorney, Agent, or Firm—Woodard, Weikart, Emhardt & Naughton

[57] **ABSTRACT**

Footrest assemblies include motorized slides extendable from the front of the chair to elevate and incline a footrest under fingertip electric control by the occupant. A slide for footrest extension is also shown. A footrest and seat assembly is mountable to an arm frame as a unit.

2 Claims, 12 Drawing Figures



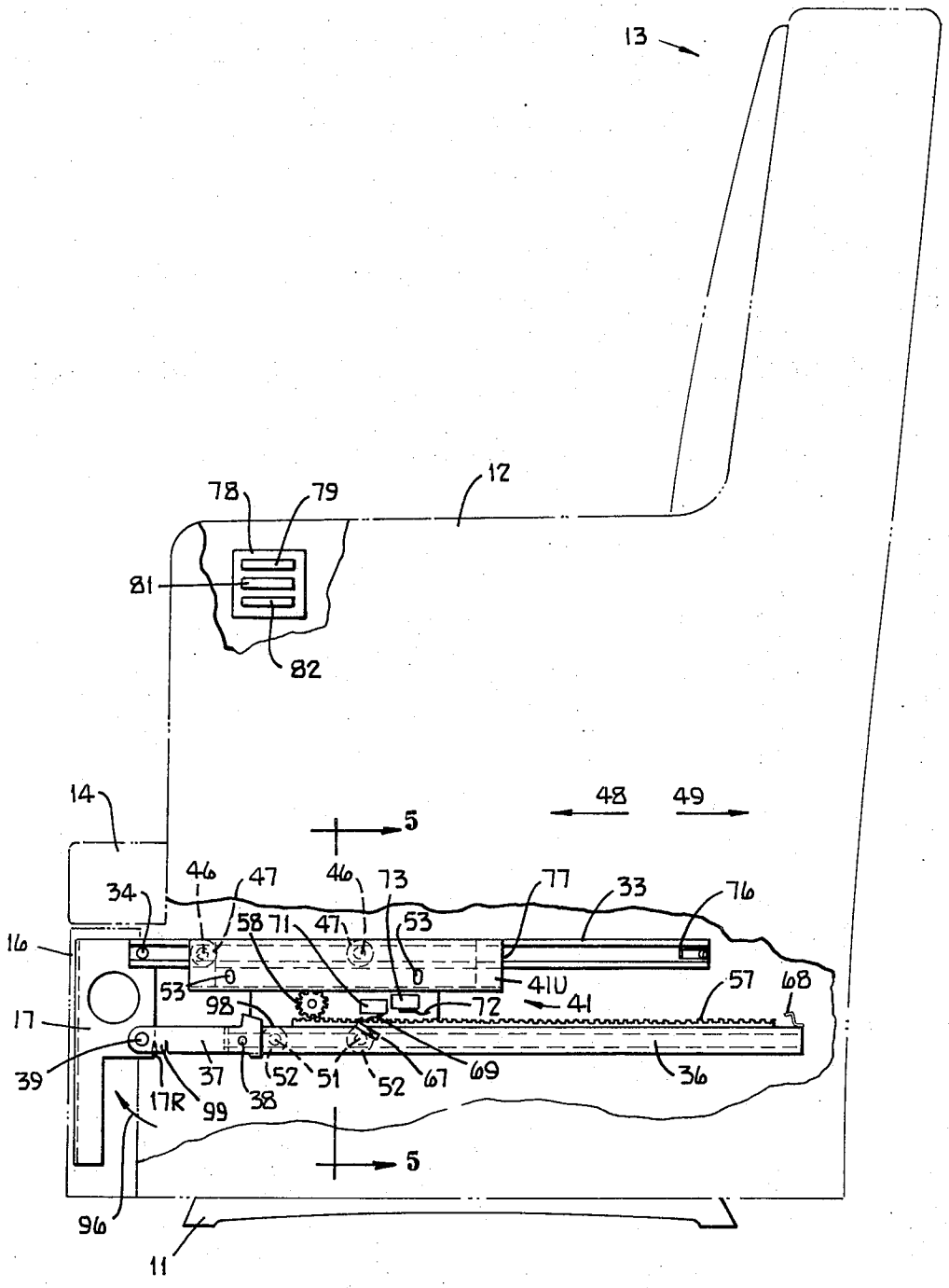


Fig.1.

INVENTOR
DANIEL F. CALDEMEYER

BY
Woodard Weikart Emhardt & Naughton

ATTORNEYS

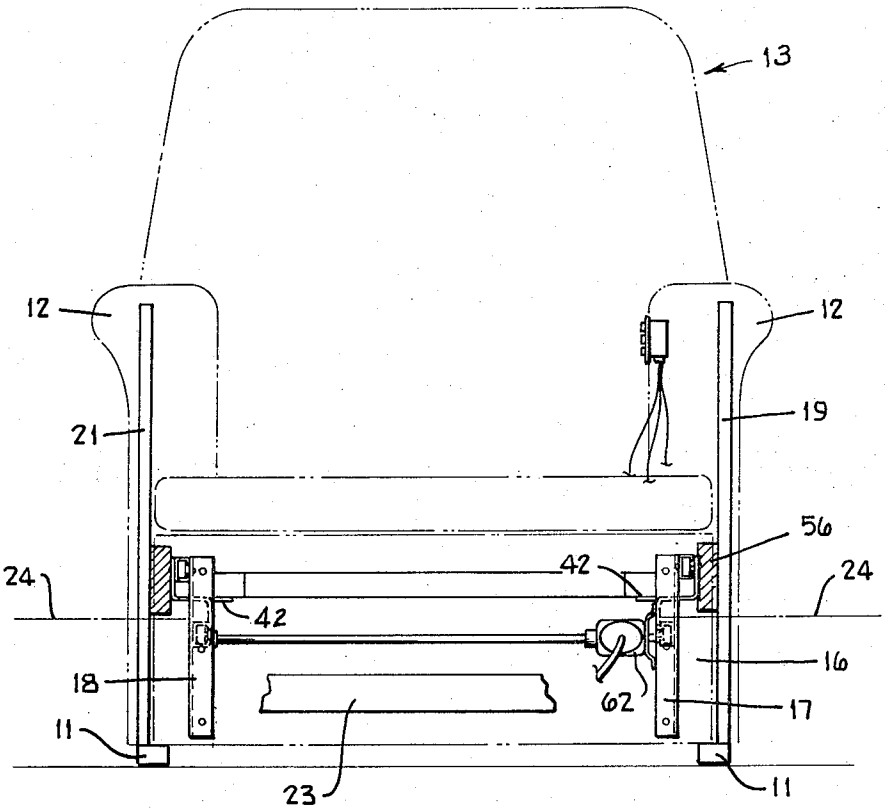


Fig.2.

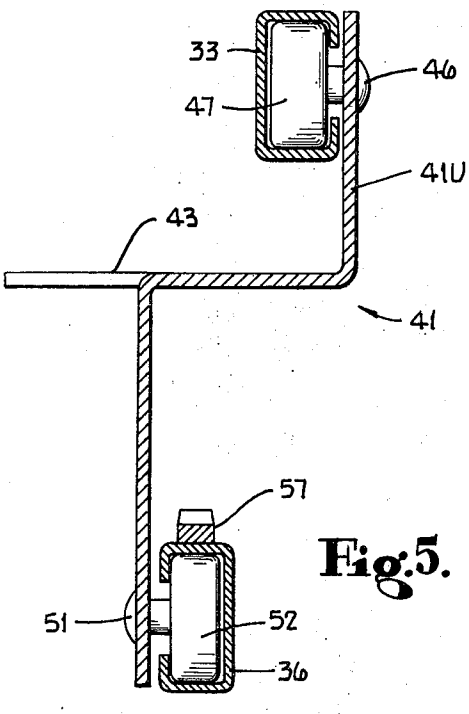


Fig.5.

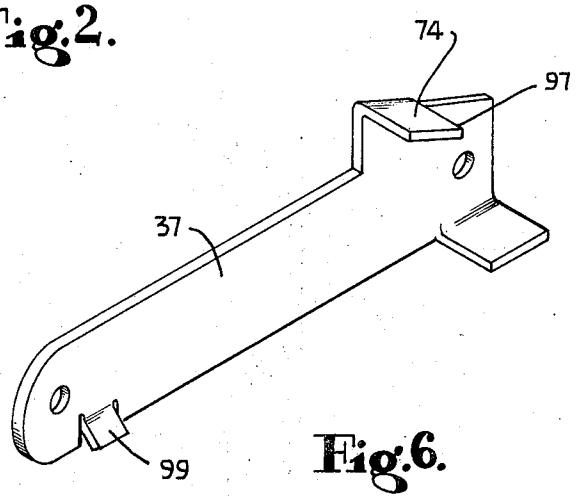


Fig.6.

INVENTOR
DANIEL F. CALDEMEYER

BY

Woodard, Weikart, Emhardt & Naughton
ATTORNEYS

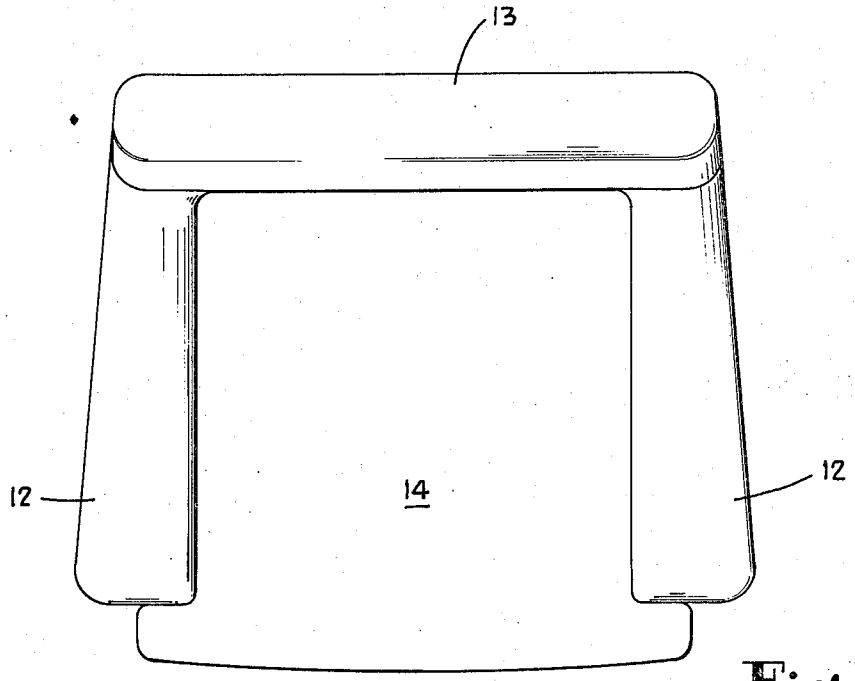


Fig.3.

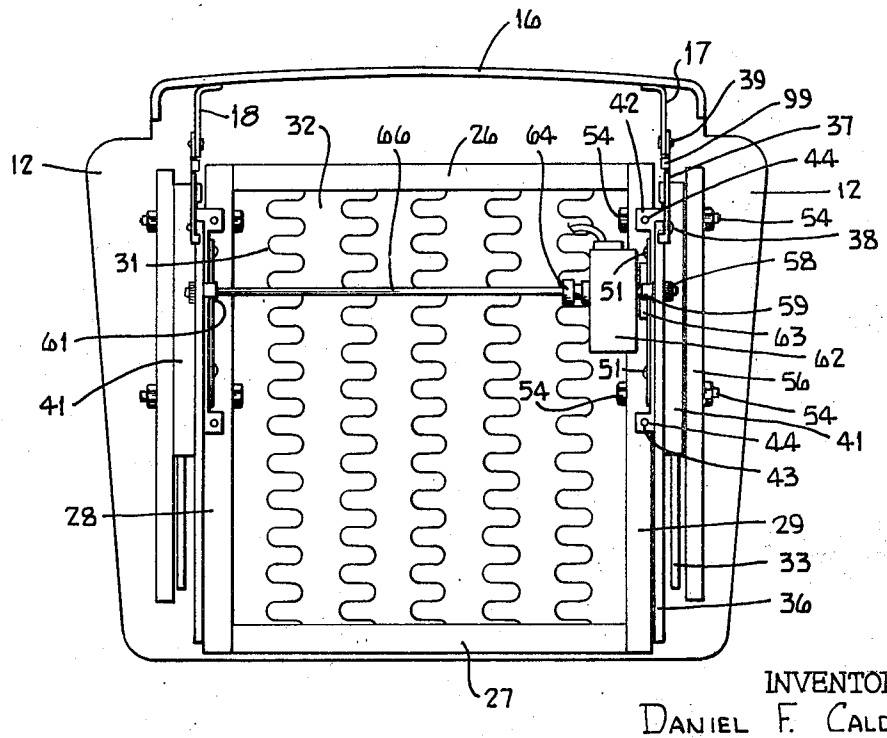


Fig.4.

INVENTOR
DANIEL F. CALDEMEYER
BY
Woodard, Weikart, Emhardt & Naughton
ATTORNEYS

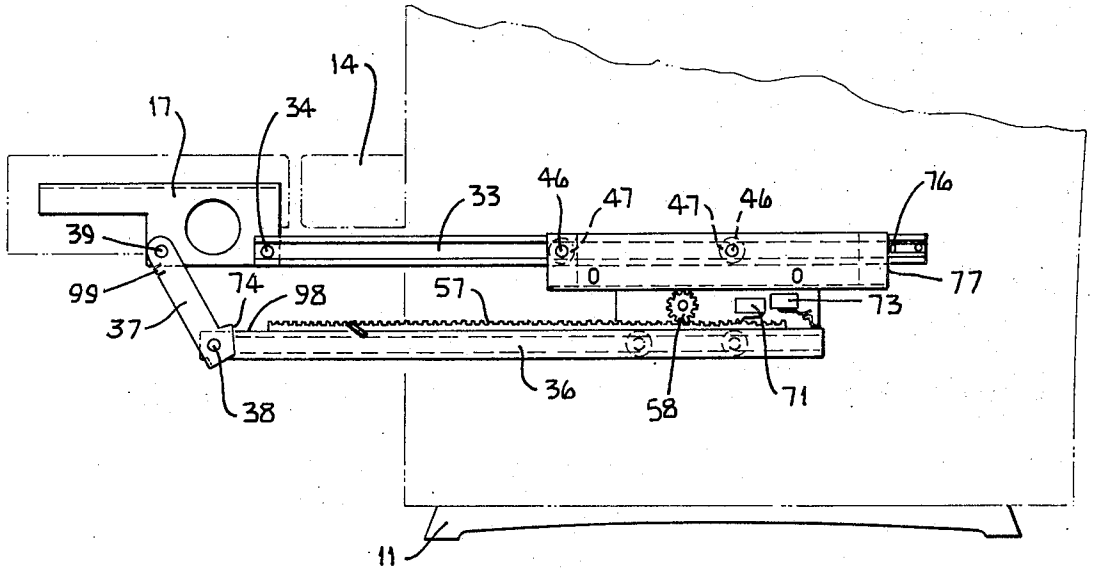


Fig. 7.

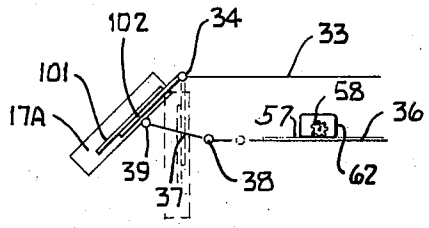


Fig. 8.

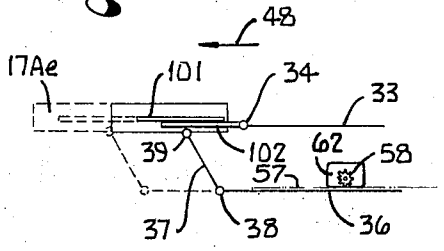


Fig. 9.

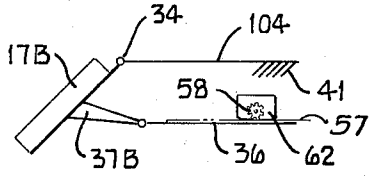


Fig. 10.

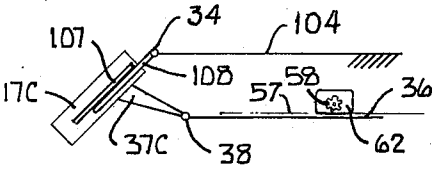


Fig. 11.

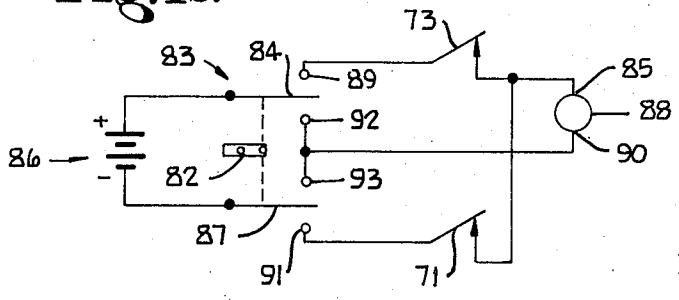


Fig. 12.

INVENTOR
DANIEL F. CALDEMEYER

BY

Woodard, Weikart, Emhardt & Naughton
ATTORNEYS

FOOTREST FOR RECLINING CHAIR

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates generally to seating equipment, and more particularly to chairs and the like.

2. Description of the Prior Art

The prior art on folding or extendable footrest for seating equipment is extensive. Some such footrests are operated by direct mechanical movement caused by manipulation of the parts by the occupant of the chair. Some of these involve linkages between the chairback and footrest whereby the footrest will be elevated upon rearward inclination of the chairback.

There is also seating equipment, particularly chairs, wherein footrest operation is controlled by electric motors. Among these are chairs wherein the footrest is linearly extendable by the use of jackscrews, rack-and-pinion combinations, or other arrangements. Examples are shown in U. S. Pat. Nos. to F. J. Luketa, 2,481,133; 2,491,898; 2,533,595; 2,668,581; and 2,684,708. One of these (2,533,595) also shows an arrangement for tilting the footrest. Other prior art more or less related to applicant's invention will be listed hereinafter. Yet, despite the rather high state of development of this art, several significant problems have remained to be solved. These include the fact that many people have become accustomed to certain styles of furniture in their residences. They are not inclined to accept chairs which look like they belong in dental offices, operating rooms, or other environments as living room furniture.

In addition to the necessity of accommodating personal tastes as to appearance of furniture, there is a need to make the furniture comfortable for persons of a variety of sizes, particularly with reference to stature.

In addition to the foregoing, it is desirable to provide furniture which average people can afford to buy. Certainly dental chairs and some of the sophisticated furniture described in the prior art cannot be manufactured and marketed at a price within reach of the average consumer.

It is an object of the present invention to provide an assembly which will serve as a major contribution to a solution of the abovementioned problems.

SUMMARY OF THE INVENTION

Described briefly, in a typical embodiment of the present invention, a footrest assembly includes a pair of slide assemblies which are power driven to initially move a footrest forwardly and then upwardly. A further embodiment provides for forward extension of the footrest when elevated. The construction incorporates a seat mount facilitating the mounting of the entire assembly including a seat in a chair frame for either a fixed seat chair or a tiltable seat chair.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a side elevational view of a chair employing a footrest assembly according to a typical embodiment of the present invention, portions being broken away to illustrate certain interior details.

FIG. 2 is a front elevational view thereof.

FIG. 3 is a top plan view thereof.

FIG. 4 is a bottom view thereof, omitting the base and arm frames.

FIG. 5 is a section taken at line 5—5 in FIG. 1 and viewed in the direction of the arrows.

FIG. 6 is an enlarged perspective view of the pivot link, showing stops thereon.

FIG. 7 is a side elevational view like FIG. 1 but with the footrest fully extended.

FIG. 8 is a schematic side elevational view illustrating another embodiment of the footrest in which additional slides are employed for horizontal extension of the footrest, the footrest being shown partially elevated in the solid outline.

FIM. 9 is a view similar to FIG. 8 but showing the footrest fully elevated and beginning its horizontal extension.

FIG. 10 is a fragmentary view similar to FIG. 8 but showing a simplified version of the footrest.

FIG. 11 is a view similar to FIG. 10 but showing the addition of a slide to the footrest of FIG. 10.

FIG. 12 is a schematic electrical diagram of the footrest control circuit employed in the typical embodiment.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring now to the drawings in detail, the chair includes a base 11, a pair of arms 12, a back 13, and a cushion 14 which is of the T-cushion variety as best shown in FIG. 3. A footrest 16 is of the "wrap-around" type as best shown in the bottom view of FIG. 4.

In the description which follows it should be understood that where the expression "left-hand" is used, it refers to those components which are to the left of center of the chair as a person sits in it. In other words, and as shown in FIG. 2, the left-hand footrest mount 17 is to the left of center, whereas the right-hand footrest mount 18 is to the right of center as related to a person sitting in the chair.

It will readily be recognized that the present invention is applicable not only to chairs of the fixed base type, but also to rockers and to multiple seating units as well. Nevertheless, to facilitate illustration, FIG. 2, for example, shows a simple structure wherein left-hand and right-hand arm frames 19 and 21 are affixed to base 11 and thereby rest on and are supported by the floor 22. These are spaced apart and affixed to appropriate cross members such as member 23 at the front, for example, to provide a sturdy base structure. The chairback 13 may be pivotally mounted to this structure to pivot on a horizontal axis 24, for example so that the occupant may set with his back supported erect, or can recline the back as desired. Various structures can be employed for this purpose, some of them being well known in the art.

A rectangular seat frame is provided with (FIG. 4) a front cross member 26, rear cross member 27, right-hand side rail 28 and left-hand side rail 29. Where the chair is to employ a loose T-cushion, it may suffice to provide simple Z- or S-springing as at 31 extending between the front and rear cross member of the seat frame to support appropriate padding 32, and the manner of mounting this seat frame according to a feature of this invention will be described hereinafter.

To provide support for the left-hand footrest mount 17 as shown in FIG. 7, there are two elongated members which in the illustrated embodiment, are channel sections. The upper channel section 33 is fastened to the footrest mount 17 by a rivet 34. Similarly, channel

section 36 is pivotally attached to the footrest mount 17 by means of a link 37, the channel section being pinned to the link by a rivet 38 and the link 37 being pinned to the footrest mount 17 by a rivet 39.

A seat mount bracket 41 whose cross sectional shape can best be seen in FIG. 5, is provided with a pair of tabs 42 and 43 disposed beneath the left-hand frame side member 29 of the seat frame (FIG. 4) and is secured thereto by a pair of screws 44.

As shown in FIG. 5 and in FIG. 1, the seat mount bracket also has secured thereto a pair of axles 46 to which rollers 47 are mounted by means of ballbearings or other suitable anti-friction means. These rollers are received in the channel section 33 and provide low friction supports and guides for linear movement of the upper channel, both forward in the direction of the arrow 48 (FIG. 1) and rearward in the direction of arrow 49. Similarly, as shown in FIGS. 5 and 1, the seat mount bracket 41 has axles 51 affixed thereto receiving rollers 52 which provide low friction support and guidance for the lower channel 36, accommodating linear movement thereof in the direction of the arrows 48 and 49 in FIG. 1. The upper outer flange 41U of the bracket 41 has a pair of apertures 53 therein through which pass a pair of bolts 54 which also pass through the left-hand side rail 29 and through member 56 of the arm frame as shown in FIG. 4, these bolts being secured by nuts threadedly received thereon. Thus the rollers provide low-friction transport means for rolling the channels out and in which respect to the chair and, at the same time, cooperating with the channel flanges for guidance of the channels.

Referring further to FIG. 1, a gear rack 57 is secured to the top of the channel member or slide 36 and extends throughout most of its length. A drive pinion 58 engages the rack and is part of a coupling 59 which is on the opposite side of the bracket from the pinion, and therefor not shown in FIG. 1, but readily apparent in FIG. 4. Similarly, a pinion coupling 61 is provided on the right-hand side as shown in FIG. 4.

A combination motor-gearhead 62 is mounted by means of a bracket 63 to the inner face of bracket 41, as best shown in FIG. 4. The output shaft from the left-hand side of the gearhead connects through coupling 59 to the pinion 58. The output shaft from the right-hand side of the motor-gearhead connects through a flexible coupling 64 and long shaft 66 to the right-hand side coupling 61 to drive a pinion for driving the rack on the lower slide on the right side.

Referring again to FIG. 1, an angularly disposed tab 67 is affixed to channel section 36 and another tab 68 is also affixed to one end of the channel section 36. Tab 67 is shown engaged with and actuating the actuating arm 69 for a limit switch 71 secured to seat mount bracket 41. The actuating arm 72 for a limit switch 73 is engageable by the tab 68 on the lower slide 36 which it is near the limit of its travel in the direction of arrow 48. A bent-over lug 74 on the link 37 (FIGS. 1 and 6) can serve a dual function as a stop and locator as will later be described. A tab 76 (FIGS. 1 and 7) on the upper slide 33 can serve as a stop against the rear edge 77 of the portion 41U of bracket 41 to limit forward travel of the upper slide in the direction of arrow 48.

As shown in FIG. 1, a switch plate assembly 78 may be provided on the inner face of one of the arms of the chair. The upper two switch buttons 79 and 81 may be employed respectively for operation of a motorized headrest and motorized chairback angle control if desired. The lower button 82 of the group may be employed for the motorized footrest control according to the present invention. For a better understanding of some details thereof, it will be helpful to refer to FIG. 12 wherein there is shown a double-pole, double-throw switch assembly 83 having one movable contactor 84 thereof connected to the positive side of a battery 86 and the other movable contactor 87 connected to the negative side of the battery. The operating lever for this switch assembly is given the reference numeral 82. A reversible direct current motor 88 has one terminal 85 thereof connected to stationary contactors 89 and 91 of switch 83. The other terminal 90 of the motor is connected to stationary contactors 92 and 93 of the switch 83. Placing the switch in one position will apply positive energy through terminal 92 to terminal 90 of the motor, the other terminal 85 of which is returned through terminal 91 and the other movable contactor 87 of switch 83 to the negative side of the battery. A normally closed limit switch 73 is disposed between the stationary contactor 89 and motor terminal 85. Similarly, a normally closed limit switch 71 is connected between the stationary contactor 91 and motor terminal 85.

OPERATION OF THE EMBODIMENT OF FIGS. 1–7

With the footrest down as shown in FIGS. 1 through 6, the angle tab 67 operates limit switch 71 so that the contacts thereof are open. On the other hand, the contacts of limit switch 73 are closed. To elevate the footrest, the occupant pushes button 82 in such a manner that the movable contactor 84 makes contact with the fixed contact 89 to apply current from the positive side of the battery through limit switch 73 to terminal 85 of the motor 88. Terminal 90 of the motor is connected through the stationary contact 92 and movable contactor 87 of the switch button to the negative side of the battery 86. This energizes the motor to drive the rack 57 forwardly in the direction of arrow 48 (FIG. 1). As this occurs, link 37 pushes the footrest mount 17 and thereby the footrest moves forward from the front of the chair, and the upper glide slide moves therewith. If the chair were unoccupied, this forward movement would continue until the stop 76 of the upper slide engaged the rear edge 77 of the seat mount bracket 41. Thereupon, a continued forward movement of the lower slide would begin to pivot the footrest mount 17 upwardly in the clockwise direction of arrow 96 in FIG. 1, around the rivet 34 on slide 33. This action would continue until engagement of the tab 68 on the lower slide with the actuator 82 on limit switch 73 would open the switch and thus break the current supply path to the motor, whereupon motor drive would stop. This would occur just prior to engagement of the inwardly extending edge 97 of the lug 74 of the link with the upper edge 98 of the lower slide. In this event the footrest would be in the fully elevated condition shown in FIG. 7.

The elevation of the footrest, as it would occur if the chair were unoccupied, has been described. On the other hand, in the event that the chair is occupied, the footrest will move forwardly until there is resistance to further forward movement thereof by the back of the calf of the leg of the occupant of the chair. In this event, the footrest begins to tilt upwardly just as though the upper slide has reached its stop 76 but, in this in-

stance, the stop may remain considerably spaced from the edge 77 of the bracket, depending upon the position of the knee of the occupant.

To retract the footrest, the button 82 is pushed so as to place the movable contactor 84 in contact with the fixed contactor 92, applying the positive side of the battery to terminal 90 of motor 88, the other terminal 85 of the motor being returned to the battery through limit switch 71, fixed switch contactor 91 and movable switch contactor 87. Accordingly, the motor drives the slides inward in the direction of arrow 49 (FIG. 1). On its way down, the footrest adapts to the position and contour of the leg calf of the occupant of the chair, so that there is comfortable support of the calf at all points during descent. Accordingly, if desired, the occupant can stop pushing the button at any point and terminate the movement of the footrest at that point. The speed reducer gears in the motor assembly itself will prevent drift of the footrest due to weight thereon, because of the large speed reduction ratio in the speed reducer. Accordingly, the footrest will move neither up nor down, unless the motor is energized. Alternatively, a motor with built-in brake may be used to prevent drift. Of course it should be understood that an A.C. motor, with or without a capacitor, and with a worm gear reduction, can be used instead of the D.C. motor and battery. If a worm gear or other high ratio speed reducer is not used, a standard brake-type motor can be used.

It was previously mentioned that the inwardly extending lug edge 97 of the lug 74 of link 37 is positioned to engage the top 98 of the channel section 36 upon attainment of a certain degree of relative angular movement between the link and the channel member. This will serve to prevent excessive travel of the member 36 in the direction of arrow 48 with respect to member 33 in the event that for some reason member 33 does not move in the direction of arrow 48 to the extent of engagement of stop 76 with edge 77. Similarly, to prevent the footrest from excessive rearward pivoting upon downward pivoting thereof, a tab 99 is bent inward on link 37 adjacent the rivet 39 and is engageable by the rear edge 17R of the footrest mount to stop rotation of the footrest when it has reached the vertical attitude.

Referring now to the embodiment illustrated in the FIGS. 8 and 9, the upper and lower slides 33 and 36 may be the same as in the previously described embodiment, so are given the same reference numerals. The same is true of the link 37. The seat mounting bracket and the remainder of the components can be the same as in the previously described embodiment, except for the footrest itself which, in this embodiment, includes a footrest mount 17A to which the link 37 is pinned by rivet 39 but which is guidingly and slidingly received by a slide assembly 101 mounted on footrest slide holder 102 which is pinned to the slide 33 at the rivet 34. The slide assembly 101 can be a ball bearing slide such as are readily available on the market, or it can be of a construction similar to that for the slides 33 and 36. In this embodiment, the footrest is driven from the position shown by the dotted line in FIG. 8, outward in the same way as in the previously described embodiment. When the footrest reaches the calf of the occupant of the chair, the footrest begins to rise. At some point during elevation of the footrest from the position shown in FIG. 8 to the fully elevated position in FIG. 9, or, in any event, beginning at the time the upper slide 33 is stopped by engagement of the tab 76 thereon with the rear edge 77 of the seat mounting bracket, the footrest mount 17A will be extended on slide 101 in the direction of arrow 48 upon further movement of the slide 36 in the same direction. In a condition of maximum extension, the footrest may be in a position indicated by the dotted line 17A*e* in FIG. 9. The inwardly turned tab 97 on the link 37 engaging the upper edge 98 of the guide slide 36, by limiting the relative rotation between teh link 37 and slide 36, assures that the footrest will be extended as shown.

Referring now to FIG. 10, there is illustrated another embodiment of the invention. In this instance, the rivet 34 is secured to member 104 affixed to seat mounting bracket 41. In this instance, the seat mounting brackets do not have upper rollers 47 because there is no upper slide as such. The lower slide 36 may be the same and may be mounted in the same way to the seat mounting bracket as in the previously described embodiment. However the member 37B is not pinned to the footrest mount 17B, but rather is affixed thereto by screws, welding, or any suitable means.

While the embodiment of FIG. 10 is not as versatile as those previously described, and may limit the choices available for seat construction, it does provide for a smooth operating, very economical, powered footrest.

FIG. 11 illustrates a still further embodiment wherein an extension is provided on the footrest of FIG. 10. In this instance, the footrest mount itself 17C is mounted by means of slides 107 to the footrest slide holder 108 which is pinned to the member 104 by rivet 34 and affixed by screws, welding, or other suitable means to member 37C. Lower slide 36 is pinned to member 37C at 38 as in the embodiment of FIG. 10. In this embodiment the footrest is extended gradually as it is elevated and thereby accommodates taller persons, while retaining the adavantages of very inexpensive construction. In this case, as in the embodiment of FIGS. 8 and 9, the slides for the footrest mount can be conventional ball bearing slides, or slides of other types, and can include a construction similar to that for the slide 36, for example.

While the invention has been disclosed and described in some detail in the drawings and foregoing description, they are to be considered as illustrative and not restrictive in character, as other modifications may readily suggest themselves to persons skilled in this art. The prior art referred to previously in this specification is as follows:

F. Richardson, U.S. Pat. No. 2,670,030; M. Watter, U.S. Pat. No. 2,571,080; J. C. Lyon, U.S. Pat. No. 2,559,127; M. Watter, U.S. Pat. No. 2,563,629; S. J. Repaich, U.S. Pat. No. 2,893,472; N. Fidel, U.S. Pat. No. 2,919,746.

The invention claimed is:

1. Seating apparatus comprising:
first and second side frame members and a back;
first and second brackets connected respectively to said first and second side frame members;
footrest mounting means movably coupled to said brackets;
one pair of elongated support members mounted on said brackets;
mesns pivotally coupling said support members to said footrest mounting means;

said support members being linearly movable on said brackets in a direction away from said back to move a portion of said footrest mounting means forward on said seating apparatus;

another pair of elongated support members mounted on said brackets and linearly movable thereon away from and twoard said back, and pivotally connected to said footrest mounting means and thereby providing the movable coupling of said footrest mounting means to said brackets;

motor drive means drivingly connected to said support members of said one pair for drive thereof away from and toward said back;

motor control means coupled to said motor drive means and operable by an occupant of the seating apparatus to move said footrest mounting means portion forward and backward on said seating apparatus;

said support members being channel sections mounted to said bracket by rollers, the support members of said another pair being parallel to and above the support members of said one pair, said pivotal coupling means including links pinned to said footrest mounting means and to said channel sections of said one pair.

2. The apparatus of claim **1** wherein said footrest mounting means includes:

a footrest mount with footrest secured thereto, said mount being pinned to said links;

a mount holder pivotally connected to said support members of said another pair;

low friction slide means connecting said footrest mount to said mount holder and accommodating linear movement of said footrest mount relative to said mount holder for horizontal extension of said footrest mount upon termination of linear movement of said channel sections of said another pair away from said back as the channel sections of said one pair continue movement away from said back.

* * * * *