May 10, 1966 E. J. GAFFNEY 3,250,569

ELEVATOR SEATS

Filed May 25, 1964 3 Sheets-Sheet 1

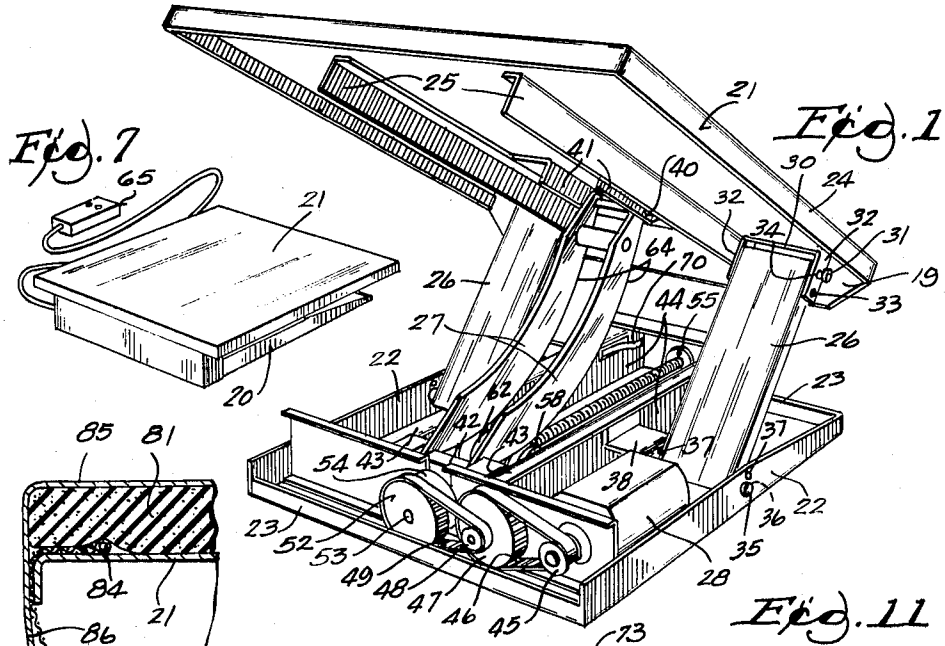


Fig. 1

Fig. 7

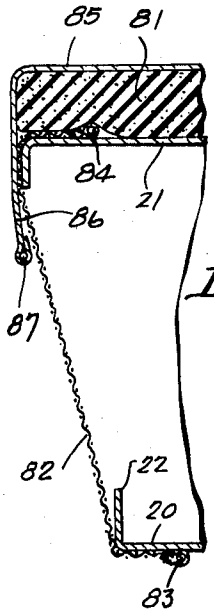


Fig. 3

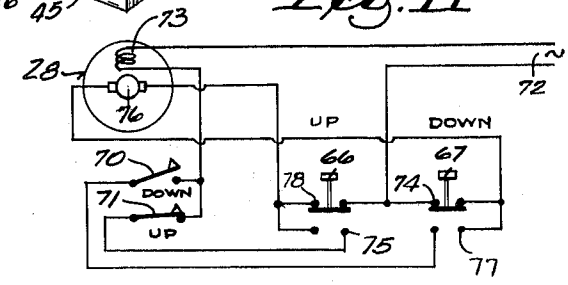


Fig. 11

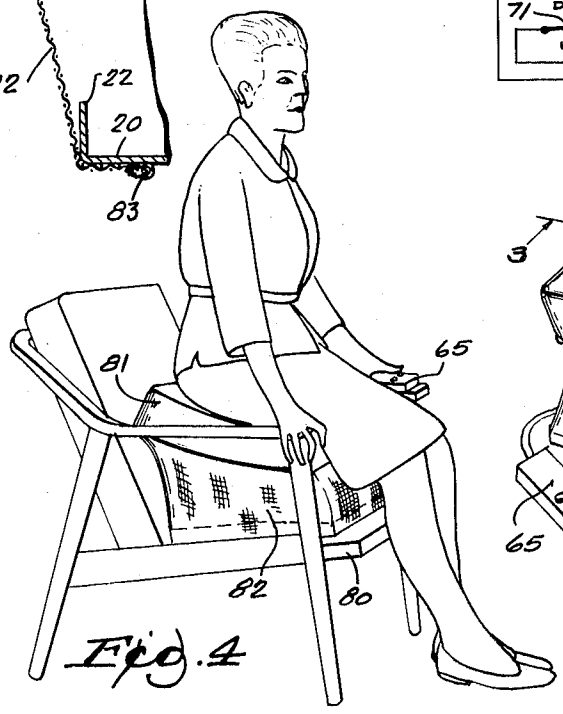


Fig. 4

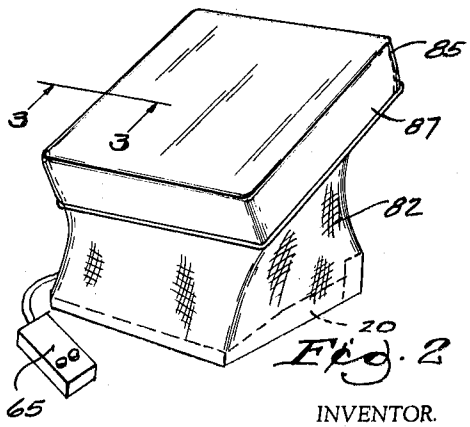


Fig. 2

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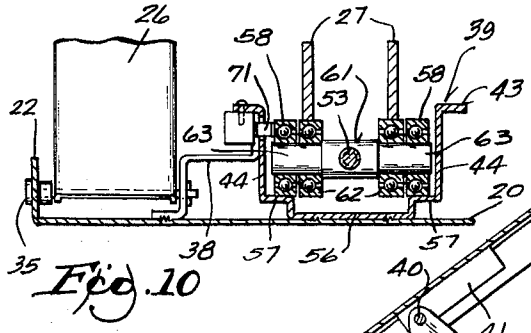


Fig. 10

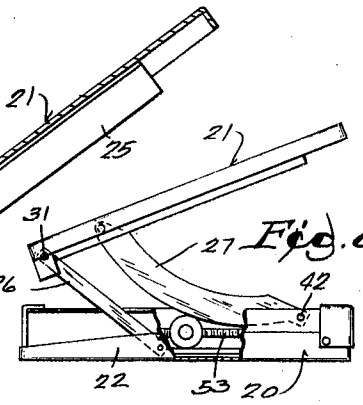


Fig. 8

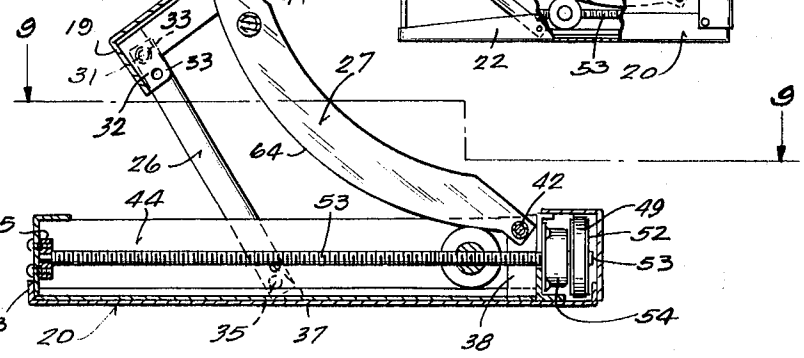


Fig. 5

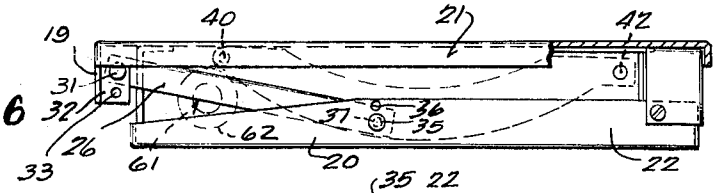


Fig. 6

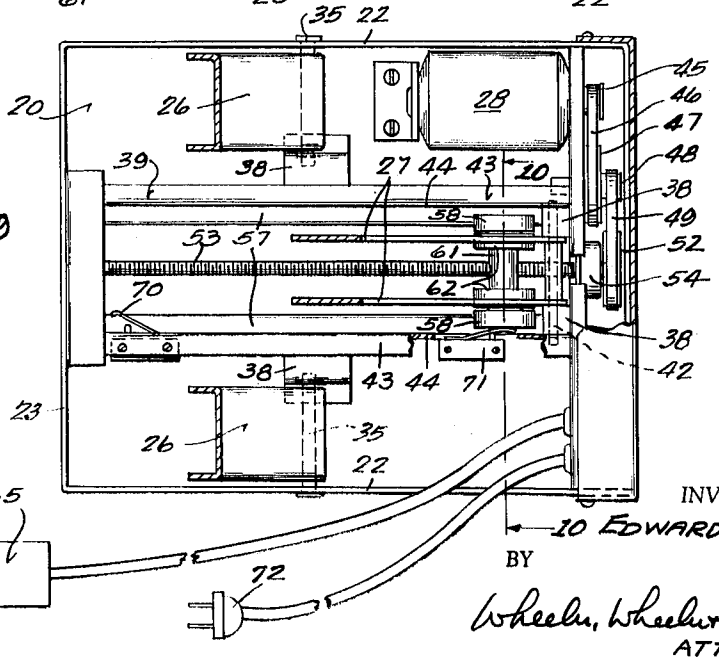


Fig. 9

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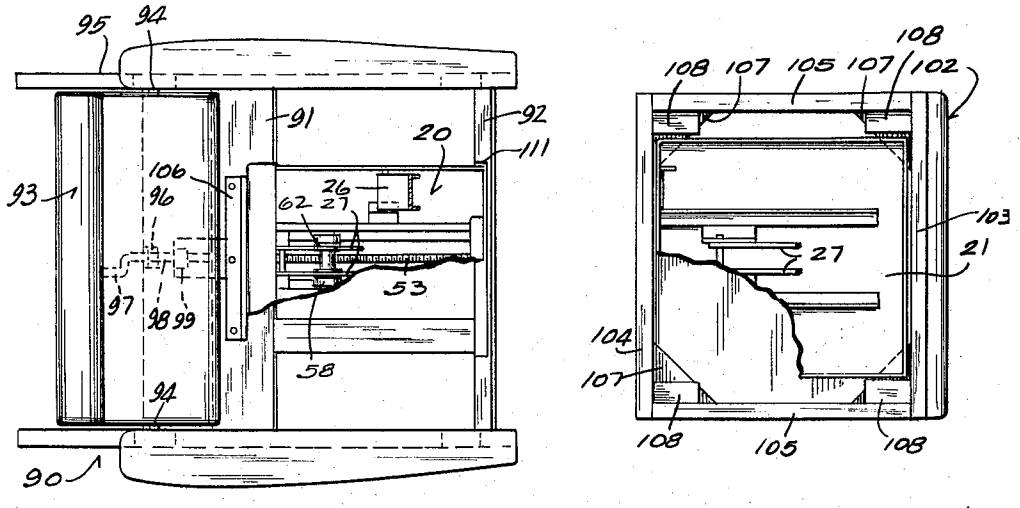


Fig. 14

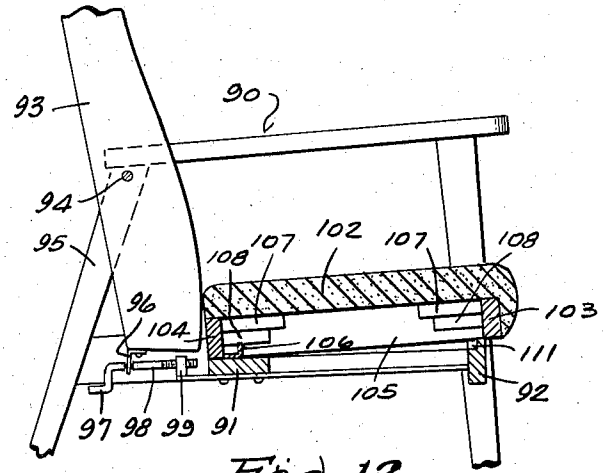


Fig. 12

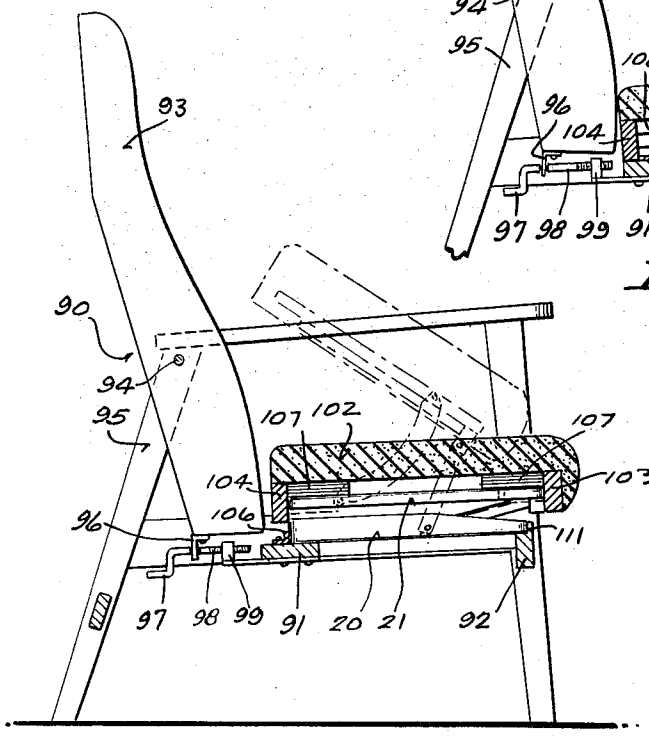


Fig. 13

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United States Patent Office 3,250,569
Patented May 10, 1966

3,250,569

ELEVATOR SEATS

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Filed May 25, 1964, Ser. No. 369,960
12 Claims. (Cl. 297—330)

This invention relates to improvements in elevator seats and particularly to a compact elevator seat unit having a low profile and adapted to be disposed between a seat cushion and seat base of a chair.

The lifting mechanism of the elevator seat unit of the present invention is compactly contained between the base and seat panels of the unit so that nothing projects outwardly from the unit. The unit is universally adapted to fit onto the seat base of any chair and beneath its cushion, thus to convert a conventional chair to an elevator chair. No part of the elevator seat unit of the present invention need be built into the chair. When closed, the unit of the present invention is only 2½ inches high. Accordingly, the seat level is raised only by 2½ inches when the unit is added to a chair. The unit is portable and may be shifted from one chair to another.

Moreover, the elevator seat unit of the present invention incorporates novel elevator mechanism, including a cam and cam follower and non-parallelogram linkages by which the seat cushion is lifted at a uniform rate and concurrently tilted forward to assist a person in arising from the seat.

The cam, cam actuating carrier and linkages are so constructed that the motor delivers substantially uniform power throughout the range of seat movement.

In one embodiment of the invention, a chair may be provided with a centering well or socket to receive the base panel of the unit.

Other objects, features and advantages of the invention will appear from the following disclosure, in which:

FIGURE 1 is a perspective view of an elevator seat unit embodying the present invention, the seat panel being shown in elevated and tilted position.

FIGURE 2 is a perspective view on a reduced scale showing the elevator unit provided with a seat cushion and with an elasticized fabric web enclosing the space between the seat panel and base panel.

FIGURE 3 is an enlarged fragmentary cross section taken along the line 3—3 of FIGURE 2.

FIGURE 4 is a perspective view of the elevator seat unit showing its use on a chair.

FIGURE 5 is a vertical cross section taken through an elevator seat unit embodying the present invention, the seat panel being shown in its uppermost position.

FIGURE 6 is a view partly in side elevation and partly in section through an elevator seat unit embodying the invention, the seat panel being shown in its lowermost position.

FIGURE 7 is a perspective view on a reduced scale showing the unit in its FIGURE 6 position.

FIGURE 8 is a view partly in side elevation and partly in vertical cross section taken through an elevator seat unit embodying the invention, the seat panel being shown in an intermediate position.

FIGURE 9 is a horizontal cross section taken along the line 9—9 of FIGURE 5.

FIGURE 10 is a fragmentary cross section taken along the line 10—10 of FIGURE 9.

FIGURE 11 is a simplified wiring diagram for the motor of the elevator seat unit of the present invention.

FIGURE 12 is a fragmentary view, partly in elevation and partly in section, showing a chair construction especially adapted for use with an elevator seat unit of the present invention, the seat cushion in this view resting directly upon the chair bottom.

FIGURE 13 is a view partly in elevation and partly in vertical section through a chair similar to that shown in FIGURE 12, but showing the elevator seat unit interposed between the chair bottom and the seat cushion.

FIGURE 14 is an exploded plan view of the chair of FIGURE 13 showing at the lefthand side of this view the chair of FIGURE 13 with the elevator seat unit mounted thereon, the right hand side of this view being an inverted plan view of the undersurface of the seat panel of the elevator seat unit.

Although the disclosure hereof is detailed and exact to enable those skilled in the art to practice the invention, the physical embodiments herein disclosed merely exemplify the invention which may be embodied in other specific structure. The scope of the invention is defined in the claims appended hereto.

One embodiment of the elevator seat unit of the present invention as shown in the drawings comprises a base panel **20** and a seat panel **21**, these being respectively provided with reinforcing edge flanges **22, 23, 24, 19**. The undersurface of the seat panel **21** is further provided with longitudinally extending reinforcing angles **25**. The top surface of the seat panel **21** and bottom surface of the base panel **20** are flat or planiform. The two panels **20, 21** are interconnected by an elevator mechanism including a pair of laterally spaced adjustable channel shaped links **26** and a pair of curved links **27** which also function as a cam by which the motor **28** raises and lowers the seat panel **21**. While the base panel **20** and seat panel **21** shown in the drawing to exemplify the invention have continuous sheet surfaces, these panels could also be skeletonized or constitute grids or like air pervious frames.

The links **26** will be referred to as the forward links inasmuch as there are nearest the front of the chair, and the curved links **27** will be referred to as the rear links as they are nearest the rear of the chair when the elevator seat unit is positioned thereon as shown in FIGURES 4 and 13.

The upper ends of the front links **26** are adjustably and pivotally connected to seat panel **21** on removable pins **31** journaled on respective legs **32** of mounting brackets **30**. The bracket legs **32** are each desirably provided with two sets of laterally aligned spaced holes **33, 34** which selectively receive the pin **31**. The opposite ends of the links **26** are similarly adjustably mounted on pins **35** selectively receivable through sets of spaced holes **36, 37** respectively in flange **22** of the base panel **20** and a laterally spaced bracket **38** mounted on the base panel **20**, as best shown in FIGURES 1, 9 and 10. The position of the pins **31, 35** may be changed to change the degree of seat panel tilt and elevation of the front edge of the seat panel **21**.

Rear link arms **27** are respectively pivotally connected to the seat panel **21** on pin **40** through brackets **41**, and to the base panel **20** on pin **42**. Pin **42** is journaled in side walls **44** of the cam carrier support channel **39** which is mounted on the base panel **20**, and in bearing blocks **38** fastened thereto.

As best shown in FIGURE 5, the pins **31, 40** connecting the top ends of the links **26, 27** to the seat panel **21** are more narrowly spaced than the pins **35, 42** which connect the lower ends of the links **26, 27** to the base panel **20**. Accordingly, the links **26, 27** comprise movable portions of a non-parallelogram linkage system connecting the seat panel **21** with the base panel **20**. When the seat panel is elevated from its lowermost position shown in FIGURE 6 through its intermediate position shown in FIGURE 8 to its uppermost position in FIGURE 5, the non-parallelogram linkage aforesaid will cause the seat panel to tilt forwardly in the course of its elevation. This

will assist a person in rising from the chair, as illustrated in FIGURE 4, by exerting both an upward and a forward component of thrust against such person.

Electric motor **28** powers the elevator seat through speed reduction means which, in the disclosed embodiment, comprises the pulley **45** on the shaft of the motor **28**, the belt **46** about both pulley **45** and large diameter idler pulley **47** on the same shaft as small diameter pulley **48**, belt **49** and large diameter pulley **52** which is fixed on the end of a screw shaft **53**. The respective belts and pulleys may have cog surfaces for positive drive therebetween. Any speed reducing mechanism could be substituted for the one herein illustrated.

The screw shaft **53** is rotatably supported at the rear of the base panel **20** on an axial thrust bearing **54** and near the front end of the base panel on bearing **55**. Its axis of rotation is mid way between the side walls **44** of the cam carrier support channel **39**. Channel **39** extends longitudinally of the base panel and is provided with a bottom web **56** welded to the base panel **20**. The channel **39** has elevated shoulders **57** between web **56** and sides **44** to form tracks for the roller wheels **58** of a carriage or drawblock **61** which is in threaded connection with the shaft **53**.

There is another set of roller wheels **62** on the respective shaft portions **63** of the drawblock **61** and which turn independently of the roller wheels **58**. Roller wheels **62** are aligned with the curved link arms **27**, as best shown in FIGURE 10. Accordingly, when shaft **53** is turned by motor **28**, the drawblock or carriage **61** will be moved axially of the shaft **53**. Outermost roller wheels **53** will roll on the tracks **57** and the innermost pair of roller wheels **62** will exert a camming effect upon the links **27** to raise or lower the seat panel **21** and will support the weight of a person sitting on the seat.

The undersurfaces **64** of links **27** are curved so that the angle of incidence of the cam links **27** with their rollers **62** will change throughout the range of movement of the roller carriage **61** along its tracks **57**. The construction is such that throughout the range of movement of the seat panel **21**, as illustrated in FIGURES 6, 8 and 5, the load on the motor **28** will be substantially constant and the seat panel **21** will have a substantially constant rate of change in position.

FIGURE 6 shows the lowermost position of the seat panel **21**. At this point, the carriage **61** is farthest from the pivot pin **42** about which the cam link **27** turns. Accordingly, horizontal movement of carriage **61** will not tend to lift the link **27** as much as it would tend to do so near the end of rearward horizontal movement of the carriage when it is close to the pin **42**, as shown in FIGURE 5, and has high mechanical advantages with respect thereto. However, because of the curved undersurface **64** of the cam link **27**, cam link **27** will have a much greater angle of incidence with the carriage wheel **62** in its FIGURE 6 position than it will in its FIGURE 5 position, where mechanical advantage is low. Accordingly, the changing angle of incidence of the curve of the cam surface **64** will compensate for the changing mechanical advantage of the roller as it moves with respect to the pivot pin **42**, thus to give a uniform rate of rise of the seat panel **21** regardless of the specific position of the carriage **61**.

The motor **28** is controlled by the electrical circuit shown in FIGURE 11. There is a control box **65** having an up button **66** and a down button **67**. These switches are normally biased to close their upper contacts **78, 74**, as shown in FIGURE 11. There is a normally closed down limit switch **70** and a normally closed up limit switch **71** as shown in the circuit diagram of FIGURE 11. The physical position of switches **70, 71** is shown in FIGURES 1 and 9. Switches **70, 71** are actuated under pressure from the roller **58** as shown in FIGURES 9 and 10. The switches **70, 71** are conveniently fastened beneath the outward flanges **43** of the channel **39**.

FIGURE 11 shows the position of the electrical switches with the seat in its down position. Accordingly, down limit switch **70** is open and up limit switch **71** is closed when the seat is down all the way. When it is desired to actuate the motor **28** to lift the seat, the up button **66** is pressed to complete a circuit from a power source **72** to the motor **28**. The circuit to the motor field coil **73** is completed through the closed limit switch **71**, the lower contacts **75** of the up button, the motor armature **76** and the upper contacts **74** of down button **67**. When the seat reaches its uppermost position, the up limit switch **71** will open under pressure of roller **62** to open the circuit to the motor. Meanwhile, down limit switch **70** has closed under its normal bias. When down button **67** is pressed it will complete a circuit through closed down limit switch **70**, lower contacts **77** of button **67**, armature winding **76**, and the upper contacts **78** of up button **66**. The motor will run in the opposite direction and the seat will now descend until it reaches its lowermost position when down limit switch **70** will open to de-energize the motor. Meanwhile, up limit switch **71** closes under its normal bias to condition the motor to again reverse direction when the up button **66** is actuated. The motor will reverse under appropriate signal from the buttons **66, 67** at any intermediate point in the range of seat movement.

As best shown in FIGURES 6 and 7, the elevator seat unit has a very low profile when closed. In a practical embodiment of the invention, the entire unit when closed is only 2½ inches high. Accordingly, it is adapted to replace the seat cushion of a chair or to be interposed between the chair bottom **80** and the seat cushion **81** of the chair, as shown in FIGURE 4. This means that the seat cushion will be disposed at a slightly higher level than formerly, but this is not regarded as a disadvantage to invalids.

Moreover, I optionally provide an elasticized fabric cover **82** which may be fitted to the unit as shown in FIGURE 3. The elasticized fabric cover **82** is in the form of a tube provided at its respective ends with drawstrings or stretch cords **83, 84** which will hold the cover snugly around the sides of the unit to conceal the lift mechanism.

The seat cushion **81** may then be attached to the seat panel **21** of the unit as shown in FIGURE 3. Seat cushion **81** is shown in this figure as having a cover **85** with an apron **86** with a drawstring or stretch cord **87** by which the cushion can be snugly attached to the top of the seat panel **21**. The seat cushion **81** can either be the same cushion formerly used on the chair bottom **80** or an entirely different seat cushion. In the latter event, it can be thinner than the original cushion if no change in ultimate level of the cushion top is wanted.

The seat unit can be operated throughout its range of movement and the elasticized fabric cover **82** will expand and retract to accommodate for movement of the seat panel **21** and will conceal in all positions the linkage mechanism within the unit and will not wrinkle or bunch up even with the unit in its lowermost position.

As shown in FIGURES 12, 13 and 14, the elevator seat unit may be provided with a chair **90** which is especially adapted to receive the unit. In this instance, the chair bottom consists of a cross slot **91** ond a front cross bar **92**. The chair has a back **93** which may be pivotally mounted on pins **94** mounted on chair frame members **95**. The bottom of the back **93** is provided with a bracket **96** having a forked connection with a stem **98** having a crank arm **97** and a threaded portion threaded into a fixed block **99** mounted on the chair bottom. Accordingly, the chair back **93** can be adjusted in its vertical inclination by rotating the crank **97**.

A conventional seat cushion **102** for the chair is illustrated in FIGURE 12 and is provided with front and rear rails **103, 104**. Rail **104** rests on the cross bar **91**. The cushion **102** is further provided with slide rails **105**. The side rails **105** rest near the front of the cushion on

the cross bar **92**. Rear cross rail **91** on the chair is desirably provided with a positioning stop bar **106** behind which the rear rail **104** on the cushion seats to hold the cushion in place.

The corners of the seat cushion **102** are further provided with gusset blocks **107** and with corner blocks **108**. The gusset plates **107** and corner blocks **108** do not have any particular function in the use of the chair as shown in FIGURE 12, other than to reinforce the seat frame corners. However, they form a socket into which the seat panel **21** of the elevator seat unit fits, as shown in FIGURES 13 and 14. For this purpose front rail **92** is provided with a notched edge or rabbit **111** which, together with the stop bar **106** on rear rail **91**, defines a socket to receive the base panel **20** of the elevator seat unit. As shown in FIGURE 14, the notch **111** and stop bar **106** confine the base plate **20** both laterally and horizontally.

The seat cushion **102** can simply be placed on top of the seat panel **21** of the elevator seat unit, the corners of which will be received against portions of the corner gusset plates **107** and laterally against the corner blocks **108**, as shown in FIGURE 14, thus to socket or telescope the seat cushion **102** onto the seat panel **21**. As is clearly apparent from comparing FIGURES 12 and 13, the interposition of the elevator seat unit between the cushion and the chair bottom adds very little to the overall height of the seat cushion and the chair has equal utility either with or without the elevator unit installed therein.

From the foregoing it is clear that the elevator seat unit of the present invention can neither be incorporated in a chair frame designed especially to receive it, as shown in FIGURES 12–14, or it can be used on any chair as shown in FIGURES 2, 3 and 4. The flatness of the upper surface of the seat panel **21** and the lower surface of the base panel, as well as the thinness of the unit when closed, as shown in FIGURE 7, is particularly advantageous when the unit is to substitute for a conventional seat cushion or to be interposed between such a cushion and a chair bottom. Accordingly, the unit is readily removable from the chair so that the chair may be used with or without the unit, and the unit is readily shifted from one chair to another.

The electric plug **72** for the unit can simply be inserted into any handy electrical socket and the motor controlled by the control box **65**. While the invention has been described as it is applied to a chair, it is clear that it may be incorporated in any seating unit.

I claim:

1. In a chair having a seat bottom, a seat and a power operated seat elevator unit by which the seat is both raised and tilted forwardly to assist a person rising from the chair, the improvement by which the seat elevator unit is readily removable from the chair so that the chair may be used with or without the unit and the unit is readily shifted from one chair to another, said improvement comprising the structure of the seat elevator unit in which the unit is made compact with a low thin profile and comprises a base panel, a seat panel and elevator mechanism between said panels including a motor for raising said seat panel with respect to the base panel, said panels having substantially flat outer surfaces which are close together when the seat panel is in lowermost position, means removably positioning the base panel on the seat bottom, linkages between said base and seat panel, means coupling the motor to the linkages to move the linkages between an upwardly projecting position to raise the seat and to move the linkages to a lowermost position in which the seat is lowered and in which said linkages are all horizontal and between said base and seat panels, thus to occupy a minimum vertical dimension, whereby

said unit has a low profile when the seat unit is in said lowermost position, said linkages comprising a non-parallelogram linkage system to tilt the seat panel forwardly in the course of elevating it.

2. The device of claim **1** in which said linkages comprise a link connecting said seat panel to said base panel, said means coupling the motor to the linkages comprising a cam in support relation to said seat panel, a cam lifting carriage mounted on said base panel and motion transmitting connecting means from said motor to said carriage.

3. The device of claim **2** in which said base panel is provided with rectilinear tracks for said carriage, said motion transmitting connecting means comprising a screw having a fixed axis of rotation, a threaded connection of the screw to the carriage whereby rotation of the screw drives the carriage along its rectilinear tracks and a rotary connection of the screw to the motor.

4. The device of claim **2** in combination with means for adjusting the effective length of said link.

5. The device of claim **2** in which said cam has a cam lifting carriage bearing surface curved on an arc which changes its angle of incidence with the carriage as the carriage moves therealong for uniform transmission of lifting force from the motor to the seat panel.

6. The device of claim **5** in which said cam comprises another link connecting the seat panel and the base panel.

7. The device of claim **1** in further combination with an elastic fabric about the sides of said unit to enclose the space between said seat and base panels.

8. The device of claim **1** in which the seat bottom of the chair has mounting means for alternatively receiving said seat elevator unit and a seat cushion.

9. The device of claim **8** in which the seat bottom of said chair is provided with socket forming means to receive said seat elevator unit.

10. The device of claim **8** in which said seat cushion is provided with socket forming means into which said seat elevator unit fits.

11. The device of claim **1** in combination with motor control mechanism including an up button, a down button and circuit means responsive to said buttons for running the motor in one direction or the other in response to manipulation of said buttons.

12. The device of claim **11** in which said circuit means comprises limit switches responive to the respective extreme positions of the seat panel to de-energize the motor.

References Cited by the Examiner

UNITED STATES PATENTS

213,512	3/1879	Landis	297—338
581,486	4/1897	Monkiewicz	108—145
974,769	11/1910	Hoff	248—376
1,178,214	4/1916	Clark	297—338
1,698,344	1/1929	Mott	297—339
2,292,618	8/1942	Davis	297—338
2,540,206	2/1951	Levitin	297—345
2,596,760	5/1952	Bryant	297—361
2,928,558	3/1960	Bamford et al.	214—1
3,023,048	2/1962	Barton	297—339
3,046,055	7/1962	Martens	297—361
3,091,426	5/1963	Bogart	248—393

FOREIGN PATENTS

530,315	12/1940	Great Britain.
766,163	1/1957	Great Britain.

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