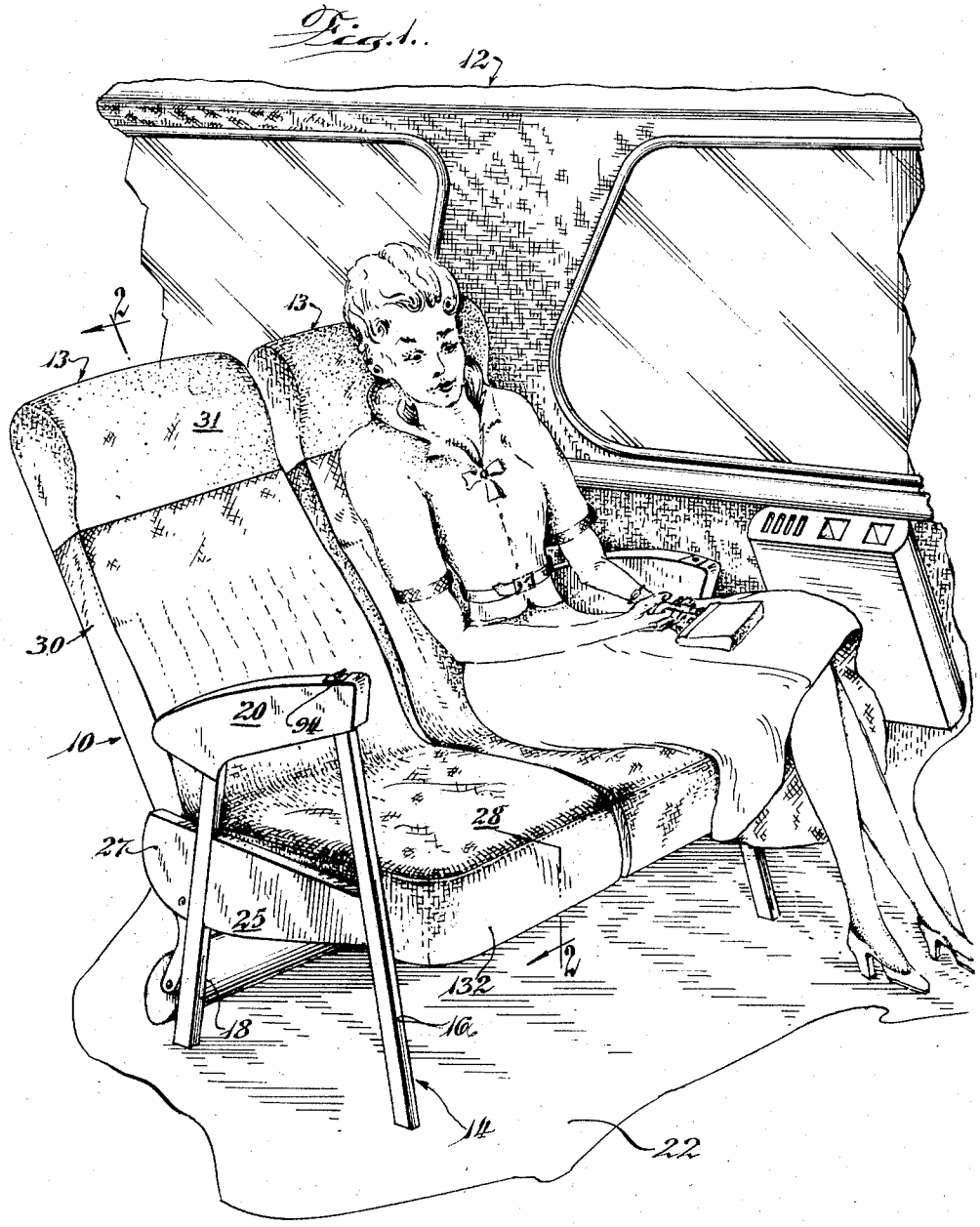
Nov. 18, 1958 O. S. CAESAR 2,860,691

RECLINING CHAIR FOR PASSENGER VEHICLES

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Fig. 1.



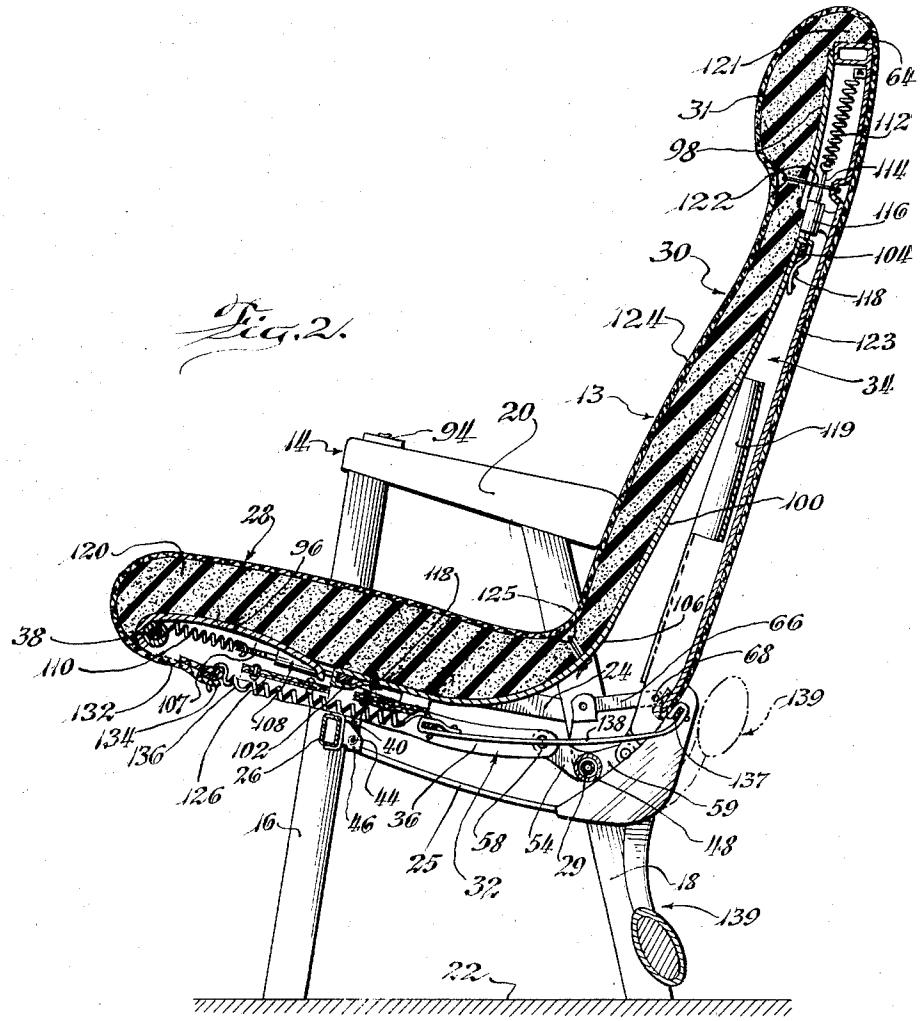
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RECLINING CHAIR FOR PASSENGER VEHICLES

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Fig. 2.



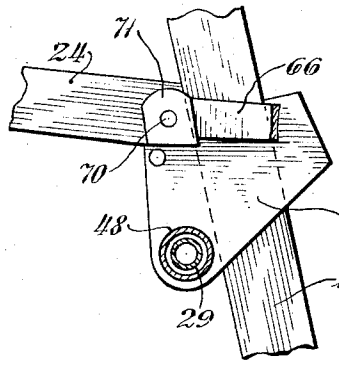


Fig. 11.

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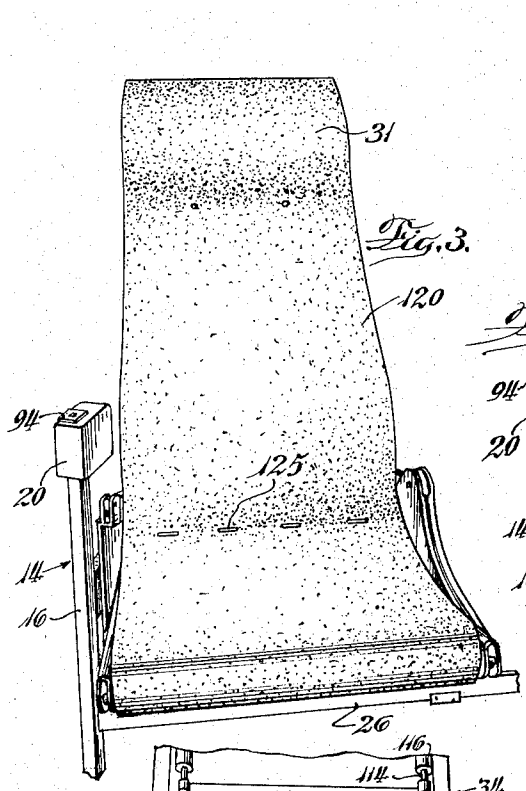


Fig. 3.

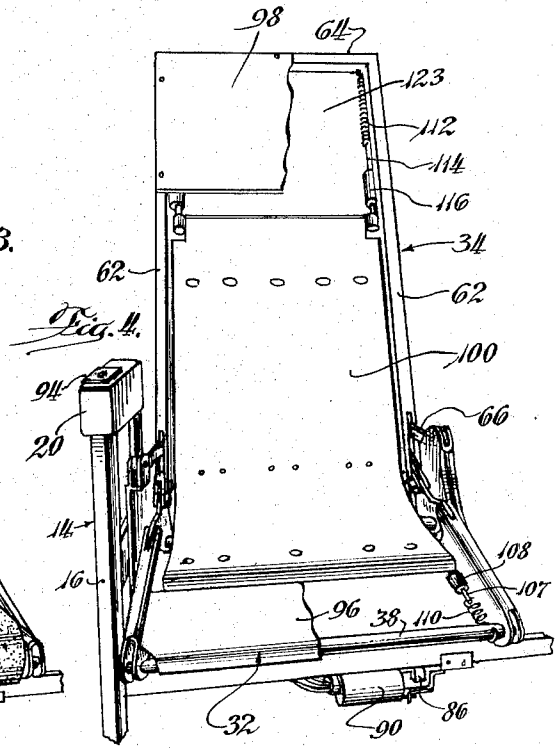


Fig. 4.

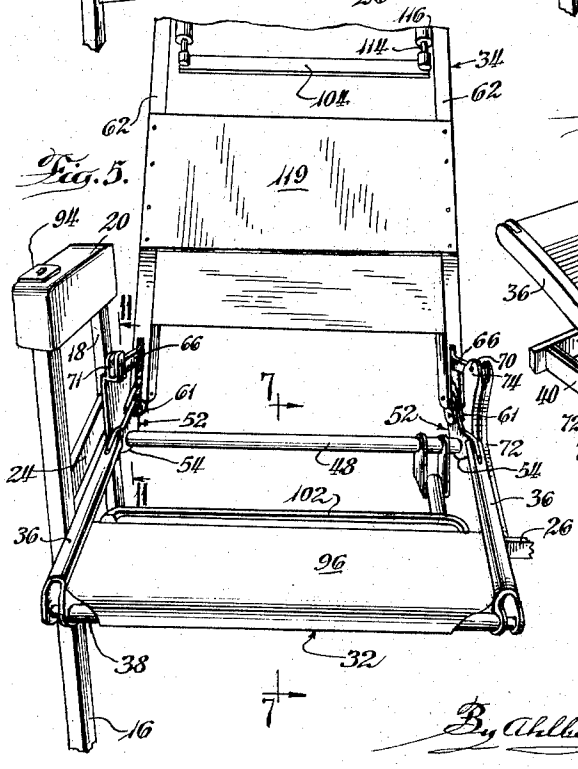


Fig. 5.

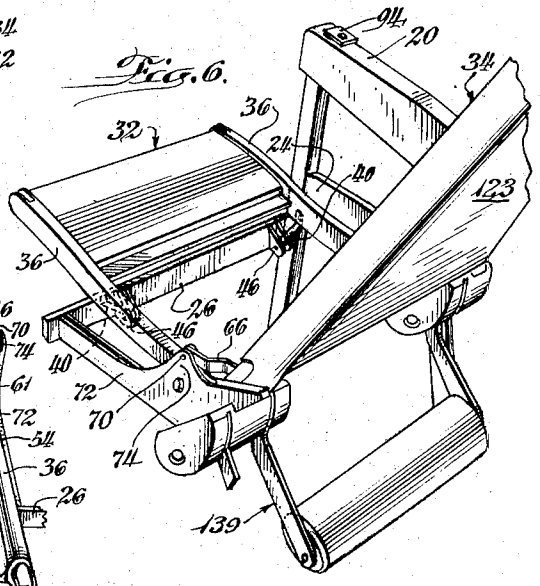


Fig. 6.

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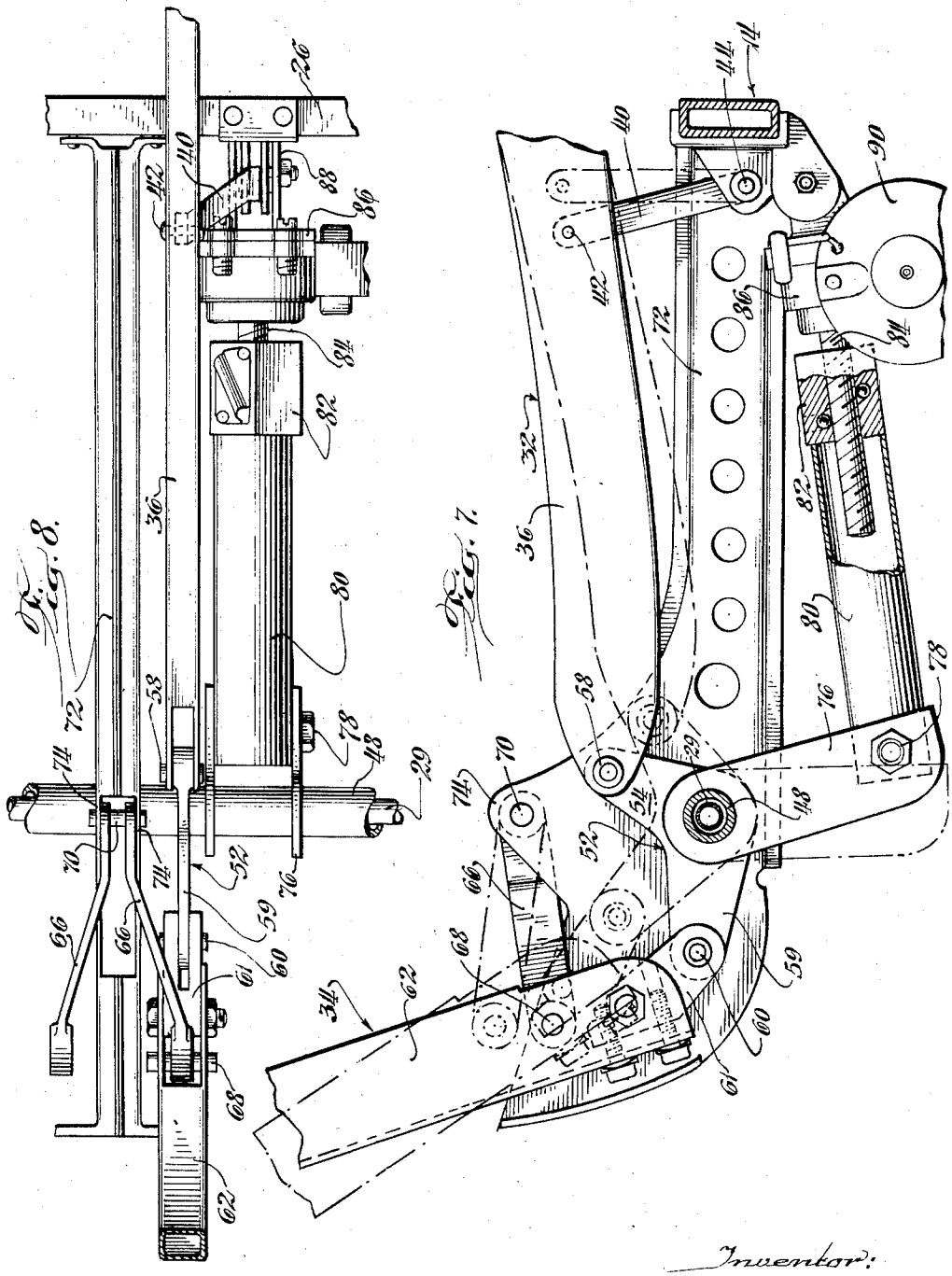


Fig. 8.

Fig. 7.

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RECLINING CHAIR FOR PASSENGER VEHICLES

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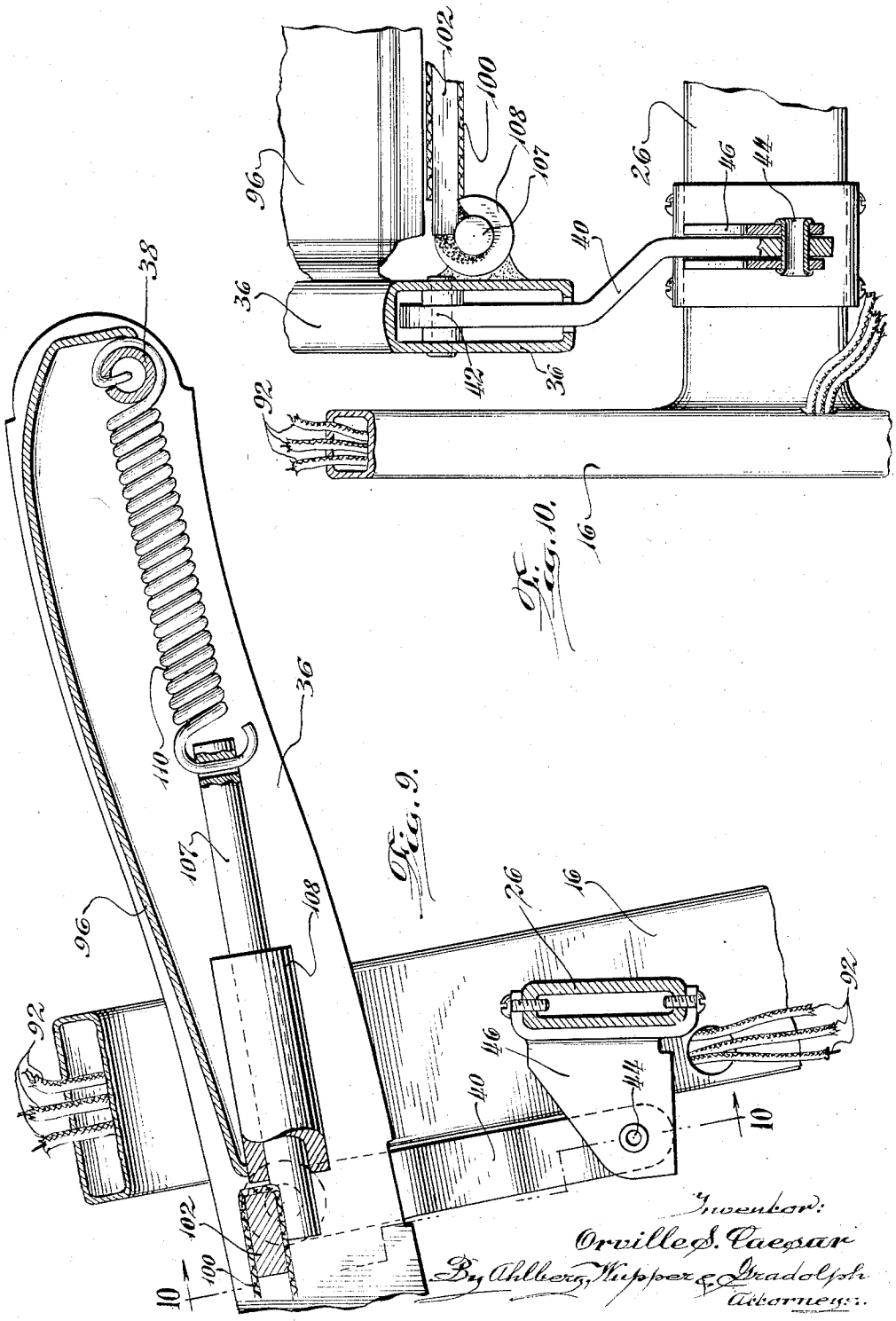


Fig. 9.

Fig. 10.

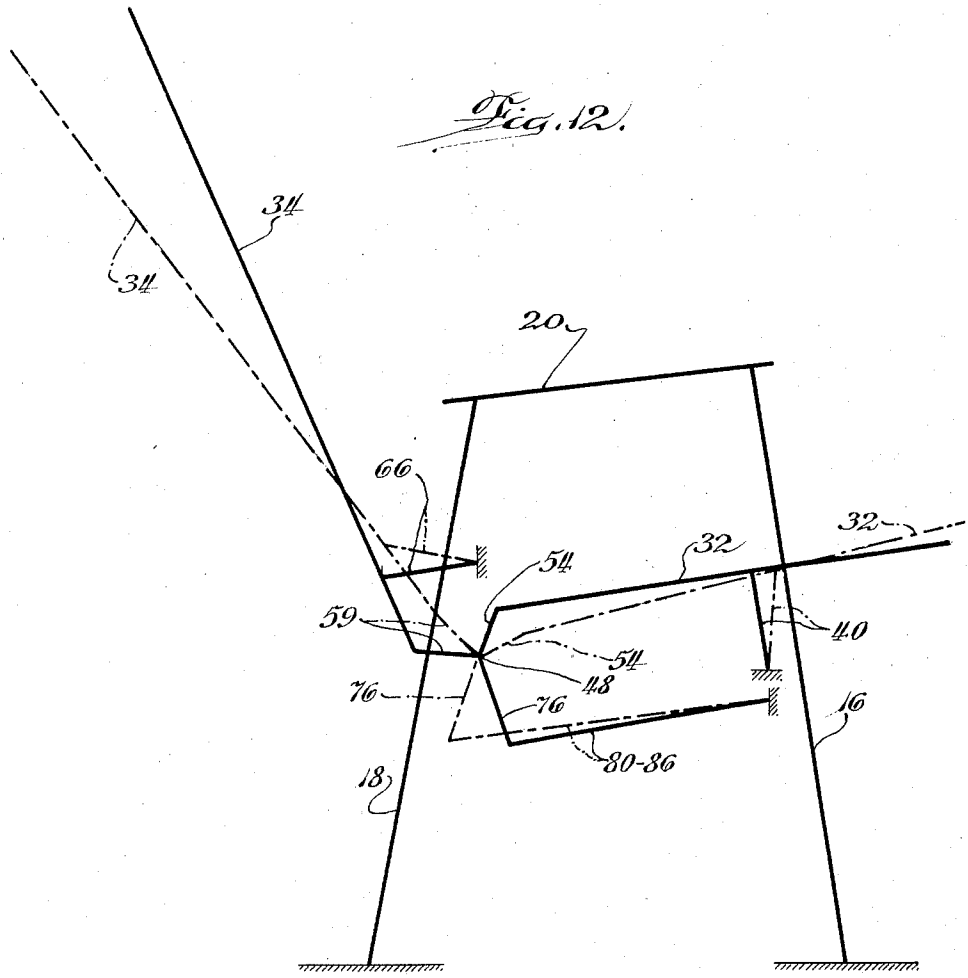
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RECLINING CHAIR FOR PASSENGER VEHICLES

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Fig. 12.

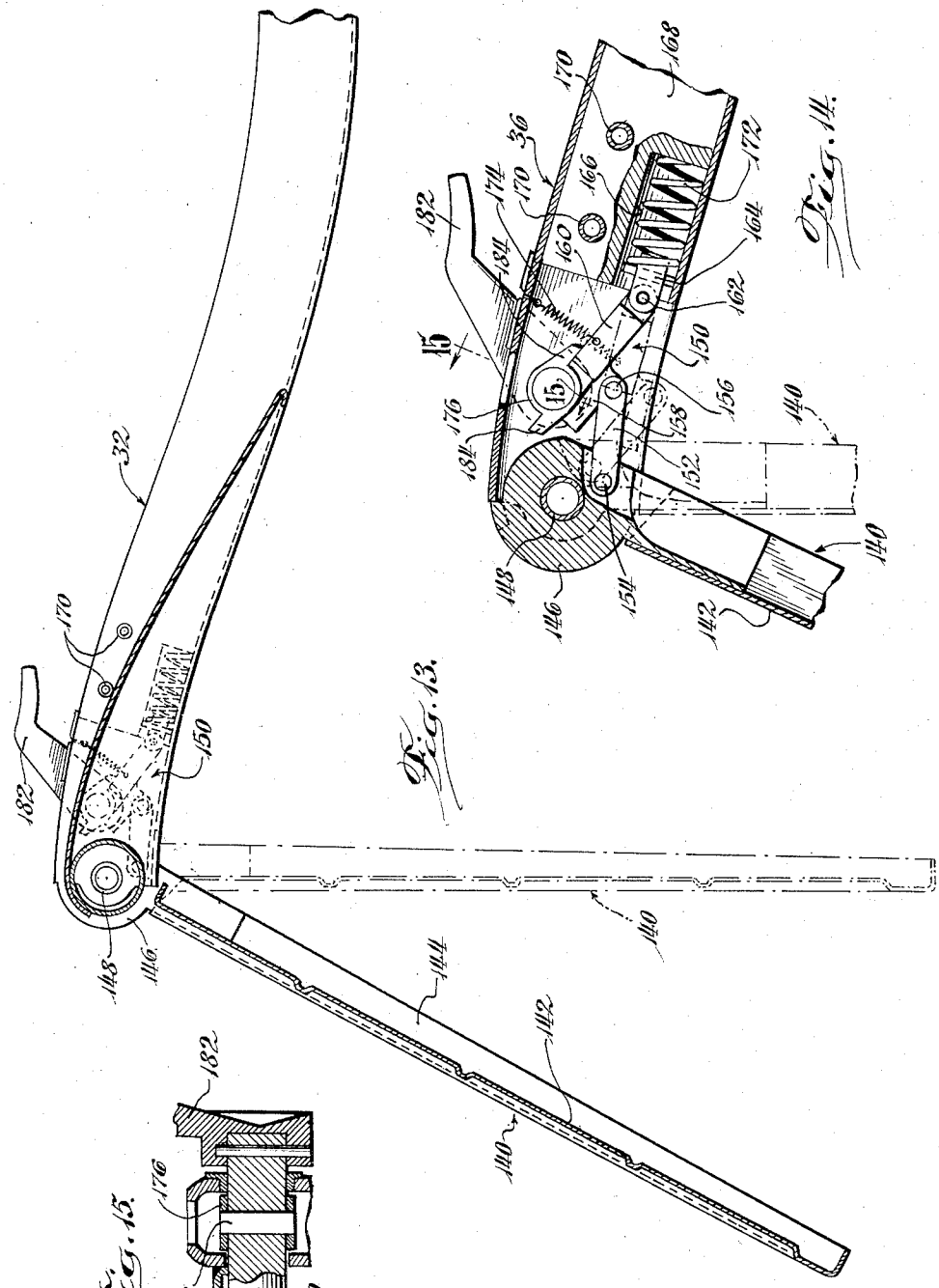


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RECLINING CHAIR FOR PASSENGER VEHICLES

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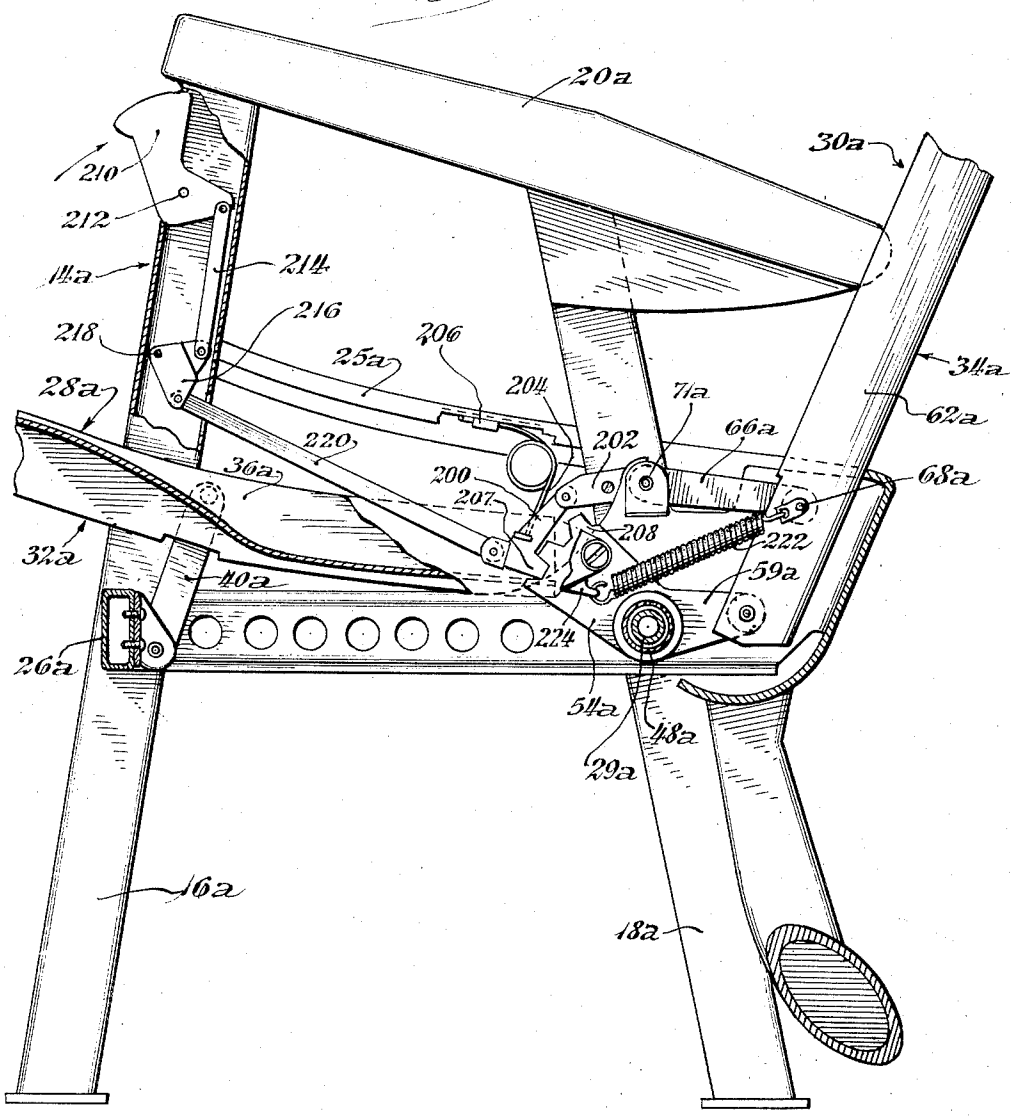
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RECLINING CHAIR FOR PASSENGER VEHICLES

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Fig. 16.



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2,860,691

RECLINING CHAIR FOR PASSENGER VEHICLES

Orville S. Caesar, Barrington, Ill.

Application February 24, 1955, Serial No. 490,190

5 Claims. (Cl. 155—116)

The present invention relates to reclining chairs and more particularly to reclining chairs for passenger vehicles.

The pleasure of a bus trip, for example, is affected substantially by the overall seating comfort afforded by the chair occupied. The fact that a chair may be comfortable at first is not sufficient. To serve the changing moods and desires of the passenger and to avoid passenger discomfort from sitting in one position, it is desirable that chairs used in vehicular service be adjustable between upright and reclining positions.

The prevent invention stems from a recognition that conventional reclining chairs used in vehicles do not provide the maximum possible seating comfort in all positions of adjustment because of imperfect angular relationships between the chair seats and the chair backs. The common expedient of adjusting the inclination of the chair back while maintaining the angular position of the chair seat fixed creates a tendency, when the chair back is in a reclining position, to slide the occupant forwardly in the chair seat. This tendency is not adequately offset by the fixed rearward inclination of the seat unless the seat has so much tilt as to be uncomfortable when the chair back is raised to its most nearly vertical position. Hence, the design of such chairs is of necessity a matter of compromise in which sacrifice in seating comfort is unavoidable.

Similar disadvantages are inherent in adjustable chairs in which a fixed angular relationship is maintained between the chair seat and the chair back for all positions of adjustment. Such chairs tend to slide the occupant forwardly or rearwardly on the chair seat in one or both extreme positions of adjustment. Moreover, a fixed relationship between the chair seat and back does not provide relaxing changes in the angular relationship between the legs and back of the occupant.

One object of the invention is to provide especially for use in passenger vehicles an improved reclining chair in which the angular positions of the chair seat and back are simultaneously adjusted and coordinated with respect to each other in a novel manner to provide maximum seating comfort in all positions of adjustment.

A more specific object is to provide an improved reclining chair of the character recited in which the angular positions of the chair seat and back are adjusted independently by common linkage means of simple, serviceable construction which inherently coordinates the positions of the seat and back relative to each other for maximum seating comfort in every seating position. A related object is to provide in an economical, practical manner for power adjustment of the chair.

Another object is to provide a reclining chair of the above character having improved cushioning and upholstery structure which further increases the comfort and serviceability of the chair.

Another object is to provide an improved chair which achieves the objects recited and at the same time makes

most efficient use of high premium space on passenger vehicles.

An additional object is to increase the seating comfort of the improved chair by the provision of optimum, below-the-knee leg support to the occupant.

Other objects and advantages will become apparent from the following description of the exemplary forms of the invention illustrated in the drawings, in which:

Figure 1 is a perspective view showing a two-passenger chair embodying the invention positioned within a bus, illustrated only in fragmentary form;

Fig. 2 is a vertical sectional view of the chair taken generally along the line **2—2** of Fig. 1, the central portion of the cushioning structure being slightly displaced from normal position to more clearly reveal underlying frame support structure;

Fig. 3 is a front view with the cover removed of the chair structure for one passenger;

Fig. 4 is a front view similar to Fig. 3, with the chair padding removed and certain parts of the supporting structure broken away to expose underlying parts of the chair;

Fig. 5 is a fragmentary view similar to Fig. 4, with additional cushioning support structure removed for clearness in illustration;

Fig. 6 is a fragmentary perspective view of the chair structure of Fig. 5 viewed from the rear;

Fig. 7 is a simplified fragmentary sectional view, taken along the line **7—7** of Fig. 5, showing one position of movable chair frame structure in solid lines and illustrating a more reclined position of the same structure in phantom;

Fig. 8 is a fragmentary plan view of the structure shown in Fig. 7;

Fig. 9 is a fragmentary vertical sectional view of the seat frame support structure at one forward corner of the chair;

Fig. 10 is a fragmentary sectional view taken along the broken line **10—10** of Fig. 9;

Fig. 11 is a fragmentary vertical sectional view taken generally along the line **11—11** in Fig. 5;

Fig. 12 is a diagrammatic view of the chair framing for a single passenger, showing one position of the adjustable frame structure in solid lines and illustrating a more reclined position of the same structure in phantom;

Fig. 13 is a fragmentary vertical sectional view of chair seat structure embodying an additional feature of the invention; i. e., a calf rest shown in solid lines in operative position and illustrated in phantom in inoperative position;

Fig. 14 is an enlarged fragmentary sectional view showing in solid lines the operative position of the calf rest support and illustrating the inoperative position of the same structure in phantom;

Fig. 15 is a fragmentary sectional view taken along the line **15—15** of Fig. 14; and

Fig. 16 is a fragmentary vertical sectional view, partially broken away for clearness in illustration, of chair structure embodying a modified form of the invention.

The first embodiment of the invention is a two-passenger chair **10** for use in a bus or similar vehicle **12** as shown in Fig. 1. In general, the chair comprises independently adjustable seat and back structure **13** for each passenger mounted side by side on a stationary frame **14**.

The specific construction of the frame **14** can be adapted to the support structure available in different vehicles. As shown, the frame **14** comprises a forward support **16** and a rear support **18** on each side of the chair extending downwardly in spreading relation to

each other from an upholstered arm rest **20** to the vehicle floor **22**. The medial portion of each support member **16** is connected with the medial portion of the adjacent support **18** by a generally horizontal frame member **24**, Figs. 2, 5, 6, and 11. The frame member **24** on the aisle side of the chair is concealed between the supports **16**, **18** by a vertical masking plate **25**, Figs. 1 and 2, which extends downwardly below the frame member. A similar plate **27** extending rearwardly from the support **18** complements the plate **25** in concealing supporting elements of the adjacent seating structure **13**.

The two forward frame support members **16** at opposite sides of the chair **10** are connected by a cross rail **26** located slightly below the forward ends of the frame members **24**. Transverse framing at the rear of the chair is provided by a seat and back support tube **29** connected at opposite ends to two brackets **31**, Figs. 2 and 11, fixed to the respective rear supports **18** near the rear ends of the frame members **24**.

Except for the common support provided by the frame **14**, the chair seat and back structures **13** for the two passengers are generally independent though similar to each other. Hence, the following description of the seating structure **13** for one passenger will suffice for both.

In general, each seating structure **13** comprises an adjustable chair seat **28** and an adjustable chair back **30** extending upwardly from the rear end of the seat. The height of the chair back is sufficient to provide a head rest **31** for the occupant.

In accordance with the invention, a frame **32** for the seat **28** and a frame **34** for the back **30**, Figs. 2, 4 and 5, are independently supported on the stationary frame **14** and simultaneously adjusted between various "reclining" and "straight chair" positions by integrated support and adjusting linkages which vary the angular relationship between the two movable frames to provide the maximum seating comfort in all positions of adjustment.

The seat frame **32** comprises a pair of hollow rectangular side rails **36** connected at their forward ends by a cross bar **38**, Figs. 5 and 9. The forward portion of the seat frame is movably supported by a pair of links **40** pivotally connected at one end **42** within the respective side rails **36** and extending downwardly to pivotal supports **44** on a pair of transversely spaced, rearwardly extending brackets **46** on the frame member **26**, Figs. 6 to 10.

The rear end of the seat frame **32** is adjustably supported on a transverse rocker member **48** journaled on the transverse tube **29** of the stationary chair frame **14**. As shown, the rocker member **48** comprises a cylindrical sleeve (also denoted by the numeral **48**). Two generally similar bellcrank-shaped brackets **52** are centrally fixed to the rocker sleeve **48** in alignment along the sleeve with the seat frame side rails **36**, Figs. 5, 7 and 8.

The two brackets **52** together form a first pair of radial arms **54**, Figs. 5, 7 and 12, extending upwardly and forwardly from the sleeve **48**. The outer ends of the arms **54** are pivotally connected at **58** to the bifurcated rear ends of the respective seat frame rails **36**.

The brackets **52** also form a second pair of rocker arms **59** extending rearwardly from the sleeve **48** at an obtuse angle to the respective arms **54**. The arms **59** preferably are somewhat longer than the arms **54**. The outer ends of the arms **59** are pivotally connected at **60** respectively to adjustable brackets **61** in the lower ends of two generally parallel side members **62** of the chair back frame **34**. See Figs. 5, 7, and 8. The back frame members **62** are connected at their upper ends by a transverse member **64**.

Additional support for the chair back frame **34** is provided by a pair of links **66** pivoted at one end **68** to the respective back frame members **62** above the pivotal connections **60** between the latter and the rocker arms **59**. As shown in Fig. 7, the length of the links **66** is somewhat greater than the distance along the respective back frame members **62** between the link pivots **68** and the support arm pivots **60**, which distance, in turn, is somewhat greater than the spacing of the support arm pivots **60** from the axis of the rocker **48**.

From its pivotal connection **68** to the back frame **34**, each link **66** extends forwardly to a pivotal support **70** on the stationary chair frame **14**.

The pivotal supports **70** at opposite sides of the chair **10** are mounted in ears **71**, Fig. 11, on the brackets **31**. Two-passenger chairs like the one shown are equipped with a central frame member **72**, Figs. 6, 7 and 8, connected at the forward end to the cross rail **26** and supported near the rear end by the tube **29**. Fashioned preferably from sheet metal, the frame member **72** has a pair of upwardly extending ears **74** located over the shaft **29** which support a common pivot **70** for the two adjacent chair back links **66**.

The seating structure **13** for each occupant is adjusted toward and away from its extreme reclining position upon angular displacement or rotation of the rocker **48** in opposite directions. The manner in which this common support and adjusting structure for the seat frame **32** and the back frame **34** coordinates the relative positions of these two frames for maximum seating comfort in all positions will be more fully described in connection with the improved cushioning structure suspended between the frames.

The rocker **48** is rotated to shift the seating structure **13** in the desired direction by a power operated adjusting linkage mounted on the stationary frame **14** below the seat **28**. As shown in Figs. 7 and 8, the linkage provided for this purpose includes a downwardly extending radial arm **76** fixed to the rocker sleeve **48** adjacent one of the brackets **52**. The free end of the arm **76** is pivoted at **78** to the rear end of an operating tube **80**. An antifriction nut **82** of conventional construction, which is shown as being of the recirculating ball type, is fixed to the forward end of the tube **80** and receives an operating screw **84** which projects forwardly of the nut. The forward end of the screw **84** is connected to and driven by a speed reducing gear assembly **86** swingably supported on a pair of brackets **88** attached to the frame rail **26**. The gear assembly **86** is operated to turn the screw **84** in either direction by a reversing electric motor **90**, Figs. 4 and 7, mounted at one side of the assembly. The gear assembly **86**, screw **84**, nut **82**, and tube **80** together form a jack mechanism which is elongated and shortened by operation of the motor in opposite directions, thus acting through the arm **76** to turn the rocker **48** about its axis.

The reversing motor **90** is controlled through electrical leads **92** extending up through the adjacent (hollow) frame support member **16** to a reversing switch **94** in the forward end of the arm rest **20**. This switch is conventional and has forward and backward operating positions and is spring loaded to a central off position. Thus the occupant has merely to push the switch **94** in one direction or the other to adjust the seating structure **13** as desired. Power to the motor circuit is supplied from the vehicle in any suitable manner.

The seating structure **13** for each passenger includes a cushion assembly supported on both the seat frame **32** and the back frame **34**. The seat frame **32** projects a substantial distance forward of the stationary support frame **14**, Fig. 2. To this forwardly projecting portion of the seat frame is attached a transverse upholstery or cushion support plate **96** which extends along the side rails **36** from the cross bar **38** substantially to the frame **14**. Preferably, the upholstery plate has a slight upwardly convex curvature as shown in Figs. 2 and 9.

Similarly, the upper end of the back frame **34** supports a slightly concave cushion support plate **98** which extends downwardly a substantial distance along the forward edge of the side members **62** from the cross member **64**.

Between the seat plate **96** and the back plate **98**, the cushion assembly is supported by a broad, flexible web **100**, Figs. 2 and 4, connected at one end to a transverse

yieldable support **102** at the rear edge of the seat plate **96** and connected at the other end to a similar support **104** at the lower edge of the back plate **98**. Suspended between the two supports **102** and **104**, the web **100** has a length such that the web normally extends donwwardly and forwardly from the back support **104** at a slight angle to the back frame **34** and rearwardly from the seat support **102** at a slightly upwardly inclined angle to the seat frame **32**. The downwardly and the rearwardly extending portions of the web **100** merge in a gentle bend **106** at the apex of the seat and back structures. For the purpose of illustration, the web **100** (particularly the bend **106**) is displaced outwardly and upwardly from its normal position in Fig. 2 to more clearly reveal underlying support structure of the chair.

As shown in Figs. 2 and 9, the support **102** for the seat end of the web **100** is formed by a transverse bar (also denoted by the numeral **102**) connected at opposite ends to the rear ends of two stems **107**, which extend forwardly through elongated apertured brackets **108** on the respective seat rails **36**. Coiled tension springs **110** connected between the forward ends of the respective stems **107** and the seat frame cross-bar **38** exert strong yieldable forces through the stems tending to hold the web support **102** against the rear ends of the brackets **108**.

The support **104** for the chair back end of the web **100** has a similar construction comprising a cross-bar (also denoted by the numeral **104**) urged upwardly by strong tension springs **112** connected between the back frame **34** and stems **114** extending through apertured brackets **116** on the back frame to support opposite ends of the cross-bar, Figs. 2, 4 and 5.

It will be noted that the mounting structure for the web supports **102** and **104** is disposed largely in underlying relation to the adjacent upholstery plates **96** and **98**. To facilitate easy removal and replacement of the web **100**, opposite ends of the web are extended around the respective supports **102** and **104** and attached to the adjacent end segments of the web by snaps **118**. A number of snaps **118** spaced longitudinally along the chair back end of the web provide for easy adjustment of the effective web length.

An auxiliary web support plate **119**, Figs. 2 and 5, having a concave shape as viewed from the front of the chair, is fixed at opposite ends to the chair back members **62** at a substantial distance below the plate **98**.

A continuous shaped pad **120** of foam rubber, Figs. 2 and 3, projects somewhat forwardly of the seat frame **32** and extends rearwardly over the seat plate **96**, the web **100**, and the back plate **98** to an upper terminus **121** turned over the upper end of the back frame **34**. A portion of the pad **120** at the upper end of the chair back **30** is thickened to form the previously mentioned head rest **31**.

The rear side of the chair back frame **34** is covered by a sheet metal plate **123** secured to both side frame members **62** and extending downwardly from the cross member **64** substantially to the lower end of the back frame, Fig. 2. The upper end of the pad **120** is anchored to the plate **98** by flexible ties **122**, Fig. 2, extending through both the rear plate **123** and the pad just below the head rest **31**. Another set of ties **125** is used to secure the bend **106** in the web **100** to the overlying segment of the pad **120**.

A sock-like, fitted cover **124** of a suitable upholstery material is slipped downwardly over the back **30**, surrounding the back substantially to its lower end. From the lower end of the back **30**, a portion of the cover **124** continues forwardly to cover the seat **28**. Flaps **126** integral with opposite longitudinal sides of the portion of the cover overlying the seat are fastened together below the seat frame.

Another flap **132** on the forward end of the cover **124** is turned under the projecting end of the seal frame **32**. A cross bar **134** reinforcing the extreme end of the flap **132** is connected by a pair of tension springs **136** and a flexible web **138**, Fig. 2, to another bar **137** used in fastening a lower edge of the cover to the lower edge of the back plate **123**. The tension thus supplied by the springs **136** to the cover **124** through the forward flap **132** assures snug, neat fitting of the cover at all times.

As will be more fully explained presently, the cushion assembly thus supported on both the seat frame **32** and the back frame **34**, cooperates with the support and adjusting linkages for the seat and back frames to provide maximum seating comfort in all positions of adjustment. Moreover, adjustment of the seating structure from one position to another does not disturb the passenger.

It is fitting, therefore, to review the manner in which the common chair seat and back support and adjusting structure operates to properly position the seat and back frame **32**, **34** in relation to each other for maximum seating comfort in all positions of adjustment.

An extreme raised or "straight chair" position of the seat and back frame linkages of the seating structure **13** for a single passenger is shown in solid lines in the diagrammatic view of Fig. 12 and in the framentary view of Fig. 7. In this position, the seat frame **32** is inclined rearwardly and downwardly at a slight angle to the horizontal. The chair back frame **34** extends upwardly and rearwardly at a small angle to the vertical.

When the seat frame **32** is in this position, its forward support links **40** extend upwardly and rearwardly from the stationary support pivots **44** at an angle to a vertical plane through the pivots. On the other hand, the rocker arms **54** supporting the rear end of the seat frame **32**, extend upwardly and forwardly from the axis of the rocker **48** at an angle to a vertical plane through the rocker axis.

The seating structure **13** is adjusted to an extreme reclining position (indicated in phantom in Figs. 12 and 7) by swinging the arm **76** and the rocker **48** in the clockwise direction, as viewed in Figs. 7 and 12. This swings the outer ends of the rocker arms **54** (attached to the rear end of the seat frame **32**) forwardly and downwardly. The downward component of the swinging movement of the arms lowers the rear end of the seat frame. The forward component of the arm movement carries the seat frame **32** forwardly, swinging the links **40** forwardly. Due to the initial rearward inclination of the links **40**, forward swinging movement of the upper ends of the links has an upward component which raises the forward end of the seat frame. The overall result is to increase the rearward tilt or inclination of the seat frame **32** as it is carried forwardly by swinging movement of the rocker **48**.

The degree to which this rearward tilting movement of the seat frame **32** is effected by a given angular displacement of the rocker **48** is determined by the dimensional relationships of a "four bar" linkage system comprising the seat frame **32**, the supporting links **40** at the forward end of the frame, the stationary frame **14**, and the rocker arms **54** supporting the rear end of the seat frame. The relative dimensions of these basic components of the "four bar" seat support are determined in accordance with conventional principles of kinematics to produce the exact movement of the seat frame **32** desired.

The chair back **30** is supported and adjusted by a "four bar" linkage system comprising the stationary frame **14**, the rocker arms **59** supporting the lower end of the back frame **34**, the back frame **34** and the links **66**.

When the chair back frame **34** is in the position shown in solid lines in Figs. 7 and 12, the links **66** extend rearwardly and downwardly at an angle to a horizontal plane through the pivots **70**. At the same time the rocker support arms **59** extend rearwardly and upwardly at a slight angle to a horizontal plane passing through the axis of the rocker **48**.

Hence, upon swinging of the rocker **48** in the clockwise direction, Figs. 7 and 12, to adjust the seat **28** toward a

reclining position as just described, the outer ends of arms **59** and the lower end of the back frame **34** are swung upwardly and forwardly. The upward component of the movement of the lower end of the back frame **34** swings the links **66** upwardly. Due to the initial rearward and downward inclination of the links **66**, upward swinging movement of the outer ends of the links (until such time as the links reach a horizontal position) has a rearward horizontal component—the reverse of the forward movement of the lower segment of the back frame connected directly to the arms **59**. The result is to increase the degree of rearward inclination of the back frame. The increasing ratio of the horizontal component to the vertical component of the swinging movement of the outer ends of the arms **59** with continued rotation of the rocker **48** in the same direction completely offsets the change in direction of the horizontal component of vertical swinging movement of the links **66** as the links pass through a horizontal position. Hence, continued swinging movement of the rocker **48** in the same direction, after the links **66** are swung vertically past a horizontal position, continues to increase the rearward inclination of the chair back **30**.

The degree of tilting movement of the back frame **34** for a given angular displacement of the rocker **48**, which also adjusts the seat frame **32** can be varied, as desired, by changing the relative dimensions of components of the previously described "four-bar" back support linkage in accordance with standard principles of kinematics.

Thus, even though the seat frame **32** and the back frame **34** are adjusted simultaneously by means of the common rocker structure **48**, the degrees of angular adjustment of the seat frame and the back frame are determined separately for each frame by the design of the supporting linkages for the respective frames.

Put another way, the interconnected seat and back support linkages provide for simultaneous adjustment of both the seat frame **32** and the back frame **34** in the same angular direction while at the same time providing for a variation in the angular relationship between the seat frame and the back frame to afford optimum seating comfort in all positions of adjustment. Hence, the attitudes of the chair seat **28** and back **30** are properly related to each other for ideal seating comfort in all positions of adjustment. In this connection it will be noted with reference to Fig. 12 that the seat frame **32** in moving from its position represented by a solid line to the more reclined position represented in phantom is turned through a substantially smaller angle than is the back frame **34** in moving between its corresponding positions represented respectively by solid and phantom lines.

The simultaneous tilting movements of the seat and back frames **32**, **34** as the chair is adjusted from upright to reclining positions increases the spacing between the connections of opposite ends of the web **100** to the medial portions of the seat and back frames respectively. This has a tendency to reduce or flatten the curvature of the bend **106** in the web as the rearward inclination of the seat and back frames is increased. In this manner the shaping of cushioning means suspended on the web **100** is coordinated with the various angular altitudes of the seat and back frames to provide optimum seating comfort in all positions of chair adjustment without disturbing the occupant as the chair is adjusted from one position to another.

As previously mentioned, adjustment of the chair to any desired position requires merely operation of the three-position switch **94** mounted on the adjacent chair arm **20**. The supporting linkages for the seat and back frames operate in the manner described to vary the angular relationships between the two simultaneously adjusted frames for maximum seating comfort in every position of the seating structure.

As shown in Figs. 2 and 6, an adjustable foot rest **139** of conventional construction is mounted on the back of the chair immediately to the rear of each seating structure **13** for the convenience of passengers seated immediately rearward of the chair shown.

An additional feature of the invention is illustrated in Figs. 13, 14 and 15. To provide even greater seating comfort to an occupant of the chair, each seating structure **13** can be equipped with a calf rest **140** swingably connected at one end to the outer end of the seat frame **32**, which is modified slightly to accommodate the calf rest.

For simplicity, only the framing and support structure for the calf rest **140** are shown. The calf rest comprises a rectangular sheet metal frame **142** approximately equal in width to the seat frame **32**. Fashioned from a generally flat sheet of metal, the frame **142** is reinforced by its marginal edges **144**, turned at right angles to the main plane of the plate.

Two swingable support members **146** for the calf rest are pivotally supported by hinge pins **148** in the forward ends of the respective seat frame members **36** and attached by welding or otherwise to the adjacent side edge of the calf rest frame **142**.

For use, the calf rest **140** is swung manually forwardly and upwardly from a vertical, inoperative position to an inclined position (shown in solid lines in Figs. 13 and 14), which provides optimum below-the-knee support to the legs of an occupant of the seating structure. The calf rest is yieldably held in this position by a very simple toggle linkage **150** duplicated at opposite sides of the seat frame **32**.

Housed largely within the hollow seat frame member **36** at the adjacent side of the seat frame **32**, each toggle linkage **150**, Fig. 14, comprises a first link **152** connected at one end by a pivot **154** to the adjacent calf rest support **146** and at the other end by a pivot **156** to a downwardly offset lug **158** on the forward end of a second link **160**. The rear end of the second link **160** is connected by a pivot **162** with a short plunger member **164** slidably positioned in the forward end of a forwardly open bore **166** in the lower side of a plug **168** fixed in the associated seat frame member **36** by a plurality of transverse pins **170**. The plunger **164** is shaped to press against the forward end of a coiled compression spring **172** bearing against the bottom of the bore **166**.

Each toggle linkage **150** is biased toward an upper, operative position by a tension spring **174** connected between the link **160** and an overlying portion of the seat frame rail **36**. Upward movement of the toggle linkage is limited, however, after the pivot **156** between the two toggle links has moved vertically past a straight "center" line between the pivots **154** and **162**, by engagement of a forwardly extending portion of the lug **158** on the link **160** with the underside of a double ended cam **176**.

As shown in Figs. 14 and 15, the cam **176** is nonrotatably fixed by a pin **178** to a transverse control shaft **180**, which extends horizontally across the seat frame **32**, passing through both seat frame members **36**. A cam **176** is attached to the shaft **180** within each seat frame member **36**.

When the calf rest **140** is manually swung outwardly to the operative position shown in solid lines in Fig. 13, the tension spring **174** for each "over-center" toggle linkage **150** pulls the linkage upwardly to an operative position in which it rests against the adjacent cam **176** as previously explained, to hold the calf rest against downward swinging movement. However, in the event a passenger should apply abnormally strong downward or rearward force to the calf rest **140**, while it is in operative position, the springs **172** will yield under the forces transmitted from the toggle linkages **150**. This, of course, allows the calf rest to swing downwardly temporarily to an out-of-the-way position.

The yieldability of the support structure which holds the calf rest **140** in extended position minimizes the likelihood of a passenger tripping over the calf rest when walking around the front of the seating structure **13** of a two-passenger chair adjacent the aisle of the vehicle in mov-

ing toward or away from seating structure adjacent the vehicle window.

When use of the calf rest **140** is not desired, the toggle linkages **150** are disabled, allowing the calf rest to swing downwardly to a vertical, inoperative position, indicated in phantom in Figs. 13 and 14. Disabling of the support linkages **150** is effected by rotating the control shaft **180** by means of a handle **182** attached to one end of the shaft.

Rotation of the shaft **180** causes one of the two projections **184** on each cam **176** to force the adjacent toggle link **160** downwardly sufficiently to carry the connecting pivot **156** between the links **152**, **160** downwardly past a center line through the pivots **154**, **162**. The weight of the calf rest **140** then scissors the toggle linkages **150** downwardly against the forces of the springs **174** to the position indicated in phantom in Fig. 14, which corresponds to the inoperative or vertical position of the calf rest.

The frame and adjusting structure of a chair embodying a modified form of the invention is illustrated in the fragmentary sectional view of Fig. 16. In general, the chair structure of this modified form of the invention differs from that previously described by the substitution of manual chair adjusting means in place of the power adjusting means of the first form of the invention.

The basic similarity in the structure of the two chairs embodying the two illustrated forms of the invention permits considerable simplification in the description of the modified form of Fig. 16. Hence, structural components of the modified embodiment of the invention corresponding to those of the first embodiment are designated with the same reference numerals with the addition of the subscript "*a*."

The chair embodying the modified form of the invention, Fig. 16, is adjusted between different positions by manual force applied to either the seat **28***a* or the back **30***a* or both. The chair is locked in various positions of adjustment by a manually controlled detent arrangement which holds the rocker **48***a* against rotation.

In the preferred construction shown, a holding pawl **200** is pivotally mounted on a bracket **202** fixed to the rear stationary frame support member **18***a* adjacent the supporting ear **71***a* for the adjacent back supporting link **66***a*. A spring **204** anchored to a bracket **206** on the masking plate **25***a* engages the back side of the pawl **200**, urging the pawl downwardly and rearwardly to engage a tooth **207** on the free end of the pawl with a serrated sector **208** formed on the widened free end of the adjacent rocker arm **54***a*, which supports the rear end of the seat frame **32***a*.

To disengage the pawl **200** from the sector **148**, manual force is applied to the upper end of a bell crank control lever **210** protruding outwardly from the forward upper edge of the adjacent frame support member **16***a*. The medial portion of the lever **210** is supported on a pivot **212** in the member **16***a*. A connecting link **214** is pivoted at one end to the rear end of the lever **210** within the frame support **16***a* and at the other end of the link to one corner of a triangular rocker **216**. A second corner of the rocker **216** is supported on a pivot **218** within the frame member **116**. The third corner of the rocker **216** is connected by a link **220** to the free end of the pawl **200**.

The arrangement of the linkage is such that inward movement of the protruding end of the operating lever **210** serves to retract the pawl tooth **207** out of operative engagement with the sector **208** to free the rocker **48***a* for adjustment of the chair in the manner described. Upon release of the lever **210**, the spring **204** is again free to engage the pawl **200** with the sector **208** upon alignment of a recess in the sector with the pawl tooth **207**.

Manual adjustment of the chair between different positions is facilitated by the counterbalancing action of a tension spring **222** connected between a lug **224** on the lower rear end of the seat frame member **36***a* and the pivotal connection **68***a* between the link **66***a* and the adjacent back frame member **62***a*.

While I have shown and described preferred embodiments of my invention, it will be apparent that numerous variations and modifications thereof may be made without departing from the underlying principles and scope of the invention. I therefore desire, by the following claims, to include all such variations and modifications by which substantially the results of my invention may be obtained through the use of substantially the same or equivalent means.

I claim:

1. An adjustable chair suitable for use in passenger vehicles, comprising, in combination, a support frame, a transverse rocker journaled on a rear portion of said frame, means for holding said rocker in various positions of angular adjustment about the axis thereof, seat support means on said rocker extending radially from the axis thereof, a chair seat frame supported at the rear end thereof on said rocker seat support means and extending forwardly along said support frame, means on said support frame movably supporting the forward portion of said seat frame, said rocker including back support means extending radially from the axis thereof, a chair back frame pivotally connected to said rocker back support means and extending upwardly generally from the rear end of said seat frame, means on said support frame articulated with said back frame in spaced relation to the connection thereto of said rocker back support means, a transverse cushion support on the forward end of said seat frame, a transverse cushion support on the upper end of said back frame, a cushion support web connected at opposite ends to the medial portions of said seat frame and said back frame respectively and suspended therebetween; and cushioning means supported on said seat frame cushion support, said web, and said back frame cushion support.

2. An adjustable chair suitable for use in passenger vehicles, comprising, in combination, a support frame, a chair seat extending from front to rear on said frame, link means swingably connected between said frame and the forward end of said seat to provide movable support to the latter, transverse rocker means journaled on said frame adjacent the rear end of said seat and including seat support means extending radially from the axis of the rocker arm and pivotally connected to the rear end of the seat, a chair back extending upwardly from the rear end of said seat, said rocker means including back support means extending radially from the axis of the rocker means and attached to said back in radially spaced relation to the rotary axis of the rocker means, link means swingably connected between said frame and said back in spaced relation to the connection with the latter of said back support means of said rocker means, said rocker means including a radial arm thereon, a screw and nut actuator connected with the free end of said arm, and a seat adjusting motor drivingly connected with said screw and nut actuator for swinging said rocker means in either direction for adjusting said chair seat and back simultaneously.

3. An adjustable chair suitable for use in passenger vehicles, comprising, in combination, a support frame, a chair seat extending from front to rear on said frame, link means swingably connected between said frame and the forward end of said seat to provide movable support to the latter, transverse rocker means journaled on said frame generally below the rear end of said seat and including seat support means pivotally connected to said seat in radially spaced relation to the axis of the rocker means, detent means connected with said rocker means for locking the latter in various selected angular positions, manual release means connected with said detent means for controllably disengaging the latter, a chair back extending upwardly from the rear end of said seat, said rocker means including back support means pivotal-

ly connected to said chair back in radially spaced relation to the axis of said rocker means, and link means swingably connected between said frame and said chair back in spaced relation to the connection with the latter of said back support means of said rocker means.

4. In an adjustable chair, the combination of a support frame, a movable chair seat frame extending from front to rear on said support frame, a movable chair back frame structurally separate from said seat frame and extending upwardly from the rear thereof, seat support means on said support frame movably supporting said seat frame and including seat adjusting means connected with said seat frame to adjust on the support frame the position of the seat frame relative to said back frame, back support means on said support frame movably supporting said chair back frame and including back adjusting means connected with said back frame to adjust on the support frame the position of the back frame relative to said seat frame, coordinating means connecting said seat adjusting means and said back adjusting means to produce a relative displacement between adjacent ends of said seat and back frames as an incident to adjustment of said seat and back frames on said support frame, a transverse cushion support on the forward end of said seat frame, a transverse cushion support on the upper end of said back frame, a first web support mounted on said seat frame rearwardly of said cushion support thereon, a second web support mounted on said back frame downwardly of said cushion support thereon, one of said web supports being yieldable toward the lower end of said back frame, a flexible support web connected at opposite ends to said respective web supports and suspended therebetween, and cushioning means supported on said web and on said transverse cushion supports.

5. In an adjustable chair the combination of a support base, a chair seat frame extending from front to rear on said base, a chair back frame structurally separate from said seat frame and extending upwardly from the rear thereof, a chair adjusting linkage connected to one of said frames to effect a relative displacement between adjacent ends of said respective frames and simultaneously adjust the angular relationship between the two frames, a transverse cushion support on the forward end of said seat frame, a transverse cushion support on the upper end of said back frame, a flexible support web suspended between the medial portion of said seat frame and the medial portion of said back frame, and cushioning means supported on said web and on said transverse cushion supports.

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UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 2,860,691

November 18, 1958

Orville S. Caesar

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 1, line 26, for "prevent" read -- present --; column 5, line 5, for "donwwardly" read -- downwardly --; column 10, line 46, for "arm" read -- means --.

Signed and sealed this 24th day of February 1959.

(SEAL)
Attest:

KARL H. AXLINE
Attesting Officer

ROBERT C. WATSON
Commissioner of Patents